No. 12.

THE BULLETIN

AND

ANNUAL REPORT

OF THE

Commissioner of Agriculture

1902.

A 1500-pound Export Beef, 3 years' old, high grade, short horn, fattened on grass by W. G. Mustard, Esq., Tazewell Co., Va.

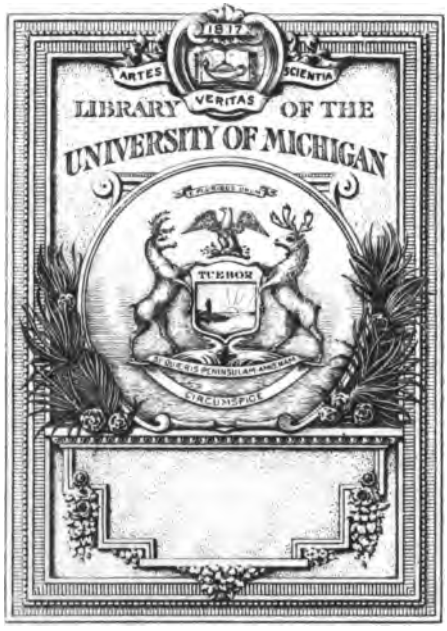
SENT FREE TO ALL FARMERS.

PUBLISHED QUARTERLY BY THE

DEPARTMENT OF AGRICULTURE OF VIRGINIA,

G. W. KOINER, Commissioner of Agriculture.

The Frank Baptist Printing Co., Richmond, Va.



REPORT

OF THE

Commissioner of Agriculture

OF

VIRGINIA,

1902.

G. W. KOINER, COMMISSIONER.

RICHMOND:
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1902.

DEPARTMENT OF AGRICULTURE OF THE STATE OF VIRGINIA.

GEORGE W. KOINER, COMMISSIONER.

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ANNUAL REPORT

OF THE

COMMISSIONER OF AGRICULTURE

His Excellency, A. J. MONTAGUE,
Governor of Virginia:

I herewith submit the twenty-fourth annual report of the work done by the Department of Agriculture for the past year. The State makes no appropriation for the support of this department, the only income is from the tonnage tax on fertilizers sold in the State. The fertilizer act restricts the use of the funds derived from this tax, after paying the expenses of inspection, analysis and dissemination of the results. The execution of the law has been vigorously carried out. The analyses of many of the brands of fertilizer sold in the State show the necessity of this law to protect our farmers from fraud and great losses. In the county of Essex a farmer bought several brands of fertilizer this year, which was inspected and sampled by the regular Inspector for that district. The samples were sent to me for analysis. The chemist's analysis showed the fertilizer to fall 22½ in one instance and 17 per cent. in another below the guarantee of the manufacturer. The farmer refused payment, suit was instituted by the manufacturer, the court of Essex county sustained the farmer. If the farmer had no fertilizer law to protect him, he would never know whether his fertilizer came up to the guarantee or fell 22½ per cent. below. The use of commercial fertilizers in the State is a heavy expense, and the sales are annually increasing. Sales for the fiscal year increased 40,483 tons. This larger increase than usual is on account of the failure in getting a stand of grass in the wheat sections of the State and in resetting those lands in grass. The sales will probably fall below this the next year.

The inspectors have been watchful and diligent in the discharge of their duties, inspecting and drawing samples of all fertilizers found. One thousand and ninety-two samples have been analyzed and published in four bulletins this year and distributed by mail to 30,000 farmers in the State, being over a hundred more samples than last year.

For further information about the analyses of fertilizers and their purity, I refer you to the report of Dr. Magruder, chief chemist on the work done in the laboratory, which is included in this report.

Our farmers appreciate the value of these bulletins, and are examining them carefully before buying their fertilizers. Many of them are using fertilizers more judiciously than formerly—using those formulas that are best suited for the different crops and soils.

FARMERS' INSTITUTES.

Institutes have been held as often as spare time could be given with the most gratifying results. I feel that the Department can spend no money more beneficially to the farmers than in practically conducted institutes; verbal communication is more impressive than printed pages. Experience proves that cold type does not possess the magnetic influence of the human voice, when spoken face to face. The attention and interest of the farmer is excited and stimulated to adopt modern methods in his business, more by the well-informed institute lecturer than in any other manner.

TEST FARM.

The Department has had the Test Farm donated by Charlotte county for a year under its control. There has been a great deal of work done in preparing the farm for experimental work, in building a house for the manager to live in, and some necessary outbuildings and clearing the farm of brush and filling gulleys, and buying stock and implements. The report of the manager, Professor Heiges, is included in this report, giving results of experiments and the work done at the farm during this year, which is as much as could possibly be done under the obstacles he has had to contend with. Several years' time will necessarily be required to get the farm in condition for best results in experimental work. Other test farms will be established by the Board in different sections of the State as soon as funds are available, which will prove valuable to the agricultural interests in those sections. This system of sub-test farms scattered over the State is practiced in nearly all of the States, and have proven to be very valuable to the farmers.

PURE FOOD LAW.

I renew my recommendations made in former reports for an appropriation by the Legislature to enable me to execute the pure-food law. Under the fertilizer law, no funds derived under that law can be used for this purpose. The health of our people and the business interests of our farmers and owners of live stock are suffering from the sale of much adulterated food and feed that is sold in this State. The prohibitory laws that exist in adjoining States make this State the dumping-ground for much of the adulterated stuff that cannot be sold elsewhere. Human food is adulterated to an extent that is injurious to the health of the consumer, and instances are well known where live stock have died from the effects of the adulteration in the feed bought in this State.

IMMIGRATION.

The inquiry for lands in this State is increasing from year to year, and more people are making their homes among us. People of larger means than

formerly are beginning to visit this State in search of farms. The high price of land in the West will increase the tide of immigration East. I believe the demand for Virginia lands will be greater than ever in the near future. The price of land is gradually increasing in many parts of this State. In some sections it has almost doubled within the last five years. If this Department had sufficient funds to advertise the State properly, there would be seen within the next few years a marked increase in the value of our lands and other properties.

MINERALS.

I am constantly receiving requests for reports on the minerals of this State. Our State is losing the investment of much capital and the development of minerals of great value by not publishing to the world the vast deposits of many varieties of minerals that now lie undeveloped by the miner and manufacturer. I have a great many requests from our own people who have minerals, and mineral water to analyze them. I would earnestly recommend a small appropriation by the Legislature to enable me to do this work for them. Frequently speculators buy up valuable mineral lands for a nominal price, because the farmer has no means to know the value of it, and there are many valuable mineral waters in this State yet unknown, except from their local curative effects.

THE OUTLOOK.

The outlook to the farmer in this State is encouraging. Many are giving more attention to a more scientific system in farming. The prejudice against science in farming, as well as in any other calling, is passing away. Knowledge is the greatest power in all lines of business. Brain has outstripped brawn in every field of human endeavor. The understanding more of nature's laws in agricultural pursuits is increasing the profits to him who guides them to accomplish his own purposes. Many are diversifying their crops—selecting those best suited to their soil, climate and markets. More attention is given to live stock, and a rational system of feeding and fattening stock is being practiced. More attention is being given to advantages this State offers to the fruit industry. More fruit trees have been set in this State in the last two or three years than ever before for that time in the history of the State. Virginia is destined to become a great fruit-producing State. Her advantages in soil, climate and market facilities are incomparable. The members of the board have taken the greatest interest in the work of the Department, the attendance at the meetings of the Board have been full and the proceedings harmonious. The work of the Department has steadily increased from year to year, the correspondence being particularly heavy. More farmers are sending in samples of fertilizers for analysis than ever before. A financial statement showing the recipts and expenditures of the Department for the fiscal year, from October 1, 1901, to September 30, 1902, is herewith submitted. The Finance Committee of the Board examines the accounts of this Department quarterly, and their report is included in this report.

Respectfully,

G. W. KOINER, *Commissioner.*

FINANCIAL STATEMENT.

For the Fiscal Year Ending September 30, 1902.

Appropriations by Board	$	134 00
Commission on fertilizer collections this year		500 00
Commission on fertilizer collections due from last year		225 00
Contingent fund, sundry office expenses		800 00
Expenses of Board of Agriculture		838 85
Expenses of inspection		6,397 11
Express, telegrams and drayage		60 93
Farmers' Institutes		1,240 00
Incidentals		20 70
Hand Book		154 72
Laboratory		1,024 14
Printing and stationery		4,352 07
Office expenses		125 20
Salaries		7,279 92
Appropriated to State Horticultural Society		523 36
Museum		50 75
Test farm, buildings, live stock, implements, fertilizers, etc.,		9,843 64
Fertilizer tags		1,236 16
Postage and mailing		263 61
Total	$	35,070 16
In hands of State Treasurer October 2, 1901, unexpended appropriation of Board	$	7,615 25
Fertilizer collections		33,283 22
Balance October 1, 1901		4,103 97
Balance Contingent Fund October 1, 1902		72 21
Total	$	45,074 65
Expenses		35,070 16
Balance	$	10,004 49
Appropriated by Board for buildings, stock, ditching and dyking at Test farm	$	4,500 00
Appropriated for Farmers' Institutes		3,000 00
Appropriation made last year, not yet expended		1,000 00
Total	$	8,500 00
Net balance	$	1,504 49

MAKING BETTER FARMERS.

Agricultural educators assert that the hope of the Nation's agrarian prosperity and advancement is in the rising generation—the young men now on the farms. This must be clear to even the most benighted economist. To everybody who has given any thought to the future condition of the country as presaged by its present developments it is equally clear that farmers of the years to come will have use for a greater store of fundamental knowledge than their ancestors possessed. Many farmers are transgressing the natural law which demands that for every pound of wealth taken from the soil an equivalent must be returned. Upon innocent posterity will be inflicted the penalty.

If these things be true the vital necessity of educating the young men and boys who are to be the farmers of the future is apparent. To their practical familiarity with common farm practice they should add a balancing measure of technical information by pursuing a course in an agricultural college. A little knowledge has been referred to as a dangerous thing; it may be said with equal truth that the want of knowledge is more to be feared. So if the farmer boy has opportunity to get only a few general fundamental principles at an agricultural college in a short course he is head and shoulders above those lacking such training when he engages in the battles of life in which the fittest survive. A few months of diligent work in an agricultural college will give an ambitious young man an appreciation of his calling and its opportunities which but few men ever perceive without scholastic training. It will increase his earning power and enlarge his creative ability. It will inspire to useful activity what is inherent in nearly every man—a love of Nature. It will fasten the habit of keen observation and lead to original investigation and research. The benefits to be derived from a course in a modern agricultural college are so great in their mental stimulus that to every farmer who has a son old enough to attend such an institution the question should appeal with irresistible force: "Can I afford not to give him the opportunity to acquire a knowledge that can be converted into cash and genuine pleasure?"—*Breeder's Gazette.*

LIVE STOCK.

NOW IS THE TIME TO KEEP MORE AND BETTER STOCK THAN EVER BEFORE.

RAISE MORE STOCK.

It is a good time now for the farmer to consider what a promising outlook there is for him to increase his growing of meat animals; or if he does not now make it an object to grow only his own supply, does not good common sense teach him that there never was a more opportune period in which to push ahead and grow beef, pork and mutton to the capacity of his farm and conditions? Meats are exceedingly dear and there is a short supply of meat animals everywhere which will require years and years to replenish. Prices will probably vary some from time to time, during a few years to come; but for a dozen years meat prices will not again be so low as they have averaged the last dozen years. Conditions point to the contrary. Take cattle, for instance. Sufficient breeding stock is not in the country They must be grown; and then there is a warring element against this. Most of the commercial beef cattle are grown on the range; but settlers have so encroached upon the ranges that public grazing lands have been growing scarcer and scarcer. Cattle and sheep have been moved from time to time to give place to settlers until there seems not to remain sufficient room for both, and the cattlemen and sheepmen are battling with each other as to which shall occupy the public lands. The cattlemen seem to have the better of the contest just now. This quarrel but proves the shortage of public grazing land. The last census report (1900) says in Texas alone over 100,000 new farms were settled upon in the last decade and probably correspondingly as large numbers in other States and Territories. Seven million head of sheep meantime have been driven back into the ranges to make room for the land settlers, and this is what causes the sheep and cattle "onpleasantness." It is very easy to see that in time not very far away all beef and mutton in this country must be grown on farms. Stock growing on the ranges is fast passing away. Stock growing enriches land, while so much grain growing as now, impoverishes it. Grow more stock, and more grain can be grown with it. And while meat animals have largely decreased in numbers human mouths to consume them have increased with the increasing population. The drought of last season in the swine belt reduced the hog crop and the output of pork very seriously. It will require a long time yet to get back onto the old basis. The beef trust first drove out beef raising on the farm by putting their prices on slaughtered meats so low that there was no profit in growing beef on the

farm. When this was done and the trust had got hold of all the range cattle, they forced retail prices up sky high where they are at present. Live stock and tillage of the soil were designed by the Creator to go hand in hand. Neither flourishes alone, never did and never will long at a time. The soil of England is so very fertile because of the combination of these two forces—live stock and thorough tillage. Only pure bred sires of recognized beef or dual purpose breeds of cattle must be used and grade up the native stock. They should be sent to the market after two summers and one winter's feeding. They must be kept growing and gaining weight all the time by feeding while young forage and grains that are rich in protein the blood, bone and muscle-forming feeds and topped off with feeds rich in carbohydrates, the fat making feeds. This is the most profitable course for the farmer to pursue. The same principle applies to all kinds of stock kept on the farm.

DORSET SHEEP AND GRADES.

The widespread and constantly increasing interest in Dorsets, results in so many inquiries for information concerning them, that we find it too great a task to answer fully all the questions asked by each individual, so we now request our correspondents to consider this accompanying brief description of the breed, as an answer to their inquiries of a general character concerning Dorsets.

Dorset Sheep are a mutton breed. Butchers like them, for they cut up well. They are medium to large, rams weighing from 200 to 225 pounds, ewes in good condition from 140 to 175 pounds. Their wool is of medium length and fibre, nice, crimp, strong, soft and selling at the highest price. As

(*Wing.*)

PULE'S SHEPHERD UTILIZING THE SURPLUS MILK AFTER THE LAMB HAS BEEN SHIPPED TO MARKET.

shearers they may be classed with Downs. In general appearance they are most pleasing. Both sexes have horns—those of rams being heavier than the ewes. These horns are not only a means of defense, but the mere possession of them creates an instinctive fearlessness that makes Dorsets less liable to attack from dogs than other breeds. This comparative immunity from injury by dogs, has led to their being called "dog proof."

The distinguishing characteristic of the Dorset is that they will take the ram in the spring as well as the fall of the year. This makes them unrivaled as early lamb producers; by having the lambs dropped in the fall they can be put on the market in competition with "hot house" lambs, without the expense of the hot house. The ewes are great milkers, and their lambs grow faster than those of any known breed. Their prepotency is so marked that an impotent Dorset ram is almost an unknown thing. This, with their good qualities, makes them valuable for crossing on grades. By continuous crossing one can build up a flock of Dorsets that, while not entitled to registry as thoroughbred, will be practically full blooded and possess all the "money making" qualities of the breed.

DORSETS FOR CROSS BREEDING.

While under the hands of competent breeders there is no sheep so profitable as the Dorset, yet for the ordinary breeder, the man who gives little attention to his flock, the cross-bred Dorsets are the more profitable. The simple truth is that Dorsets have a wonderful power to make good anything with which they may be crossed.

It is a wonderful illustration of the influence of male blood that when the Down is crossed on the Dorset ewe the result is a lamb having the appearance

(*Wing,*)

A GRADE DORSET AND SHROPSHIRE.

of the Down, black or brown head and legs, smoothness, etc. In England the last cross on the Dorset ewe is apt to be a Hampshire. It is interesting as indicative of what we will come to when Dorset ewes are so plentiful that we can put them to such a use, which will not be for many years yet. The more common use of the Dorset in cross-breeding is as a sire, on either ewes

of Merino or Down origin. The Dorset crosses admirably on Merino foundation. The lambs grow quickly, fatten easily, weigh from 10 to 20 pounds more at weaning time than pure bred Merinos. They also weigh better than other cases of cross-bred lambs from Merino mothers.

Naturally when the Dorset is used it is more often to produce early lambs than to produce feeders. Owing to the scarcity of pure-bred Dorset ewes in America, it is common to use the half-blood Dorset ewes as mothers of early lambs. They are indeed excellent ewes for this purpose, dropping their lambs much earlier than common ewes, having much more milk for them and being in all ways desirable. The 3-4-blood ewes, are even better, and for the ordinary breeder are better than pure-bred Dorset ewes, as they are less trouble and give nearly as good results. In all cases it is advisable to use the pure-bred Dorset sire, owing to the fact that his lambs fatten as readily as any and much more readily than most, and by using him you are able to reserve for future use in the flock the best of the ewe lambs. When Dorset ewes are much more numerous than now, the use of the Down ram will be admissible. While the Shropshire is a grand good sheep and should generally be bred pure, yet when the lambs are designed to be fed for market, the use of the Dorset sire on Shropshire ewes produce fine result. There is no doubt that the lambs of this class grow more rapidly than pure-bred Shropshires, attain great weights at a given age and fatten more easily. It is a curious fact that these lambs from Dorset sires and Shropshire ewes are pure white, generally without a trace of black, having the characteristic shape of the Dorset, but generally without horns. The wether lambs if they have horns at all, have such small ones as to be insignificant.

J. E. WING.

A GOOD SAFE PROFIT IN RAISING SHEEP UNDER CAREFUL MANAGEMENT.

Dr. Wm. H. McClung: It has been just 30 years, since I commenced in the sheep business. Have tried Merinos, Cotswold and Lincoln, with varied results. I secured the Shropshire and Southdowns, and was better pleased. I think they are the sheep for this section of the country. They are close wooled and so far have had no foot rot. I cannot raise sheep by keeping too many together, and cannot keep a flock too long in the same quarters without disease. The ewes usually run out on the sod most of the winter and get very little grain. Have always practiced keeping the finest and best ewes and sell the culls, but sell no others.

One of the first things to do is to keep the sheep healthy. Second, to breed carefully. Third, to know how to sell.

It has cost $55 to keep 100 ewes per year. Ewes will last as breeders about eight years. Sheep will not do well in high grass; the pasture must be growing, green and succulent for sheep to thrive and do well. Consider that there is no money in the wool, but it about pays for keeping the sheep. The money is in the mutton. Following is a statement of the yearly profits in 100 ewes:

Cost of keeping and profits derived from 100 ewes within twelve months:

Feed and attention, clipping, etc., $155.

Wool, $120.

One hundred lambs, $350.

Total, $470.

Feed, etc., $155.

Clear profit, $315, on an investment of $400, price paid for 100 ewes, which are still on hand. These ewes can be bred until they are eight years old.

The clear gain	$315.00
At 8 per cent	.08
	$2,520.00

At this ratio of profit in 8 years an investment of $400 yields $2,520.

This estimate is made below actual profits, so as to cover reasonable loss by death, from dogs, accidents and diseases.

The recent great drought in Australia, when a great number of stock sheep died, has already increased largely the export demand for mutton from this country and will continue for some time to come.

FEEDING YOUNG LAMBS.

S. H. Todd, of Ohio, a very successful stock-grower, gives the following suggestions in the *New York Tribune Farmer* regarding the feeding of lambs:

"It is very important that the young lamb should be taught early in life to eat grain, that he may not get stunted and run down in condition, and to relieve the ewe as well of unnecessary taxation and worriment. Have a small room where lambs can go by themselves to learn to eat. Make the partition

(*Wing*)

WINTER LAMB.

Ready for New York Market and good for $10 (from Pule's place).

forming the room of slats, far enough apart to receive the lambs. Have this on the south side of the building, and have plenty of windows to let in the sun and light. For these are important factors in the growing of a lamb. Have a box trough about eight to ten inches high from the floor. Put a board over the trough, four inches from the top, so the lamb can't get into the feed. If a lamb can have his own way, the first thing he does is to jump into the feed, and after he has stood in it for a few minutes, he will refuse to eat it. Partition off the trough to make four apartments. In one have corn, ground half the size of a wheat kernel; in another have bran; in another unground oats, in the fourth old process oilmeal, ground to about the size of a wheat kernel. Have a little manger, with slats up and down, built so that the lamb can't get into it, and filled with the best clover hay.

"Feed ewes for their roughness corn fodder and clover hay. Here will be trouble. The mischievious little lambs will pile right into the manger on the hay, and soon have it in such condition that the ewes won't relish it. To avoid this, make a covering of light lumber for the top of the manger. Let this be hung on hinges so you can raise it up to put in hay. Then let it down to the hay, and the lambs will use this covering as a runway, and thus avoid treading the hay."

POINTS ABOUT HOG FEEDING.

There is a tendency by many to rely on corn feeding for all stages of hog growth. This is a mistake, and is well referred to by Mr. J. J. Ferguson, in the *American Swineherd*. He says:

"Without any question, corn is and must continue to be the staple food of the corn belt States. Any system of feeding which attempts to ignore this fact is not applicable to this wide territory. But feeders make a mistake when they make a hog out of a baby shoat. Every tendency of corn feed is to develop fat. What the youngster needs is muscle-making food, something to make him grow and build up bone, sinew and lean meat. Nothing has yet been found which fills the bill so well as a ration of which the basis is skim milk in conjunction with shorts, middlings and finely ground oats or barley. All these are flesh-formers. Corn is a fat-former. We know a skim milk diet is not possible upon a majority of farms in a corn country, so we must find a substitute. We have found the following meal mixture to give very satisfactory results:

Oats, finely ground	50 per cent.
Barley, finely ground	20 per cent.
Shorts	20 per cent.
Oil Meal	10 per cent.

"We have found that for the first 8 weeks of a young pig's life that it is both safer and cheaper to feed him through the medium of his dam. The youngster weaned at 6 weeks is likely to carry a harsh coat and to have serious trouble with his digestion. We provide creeps, or private runs, for the young pigs, permitting them to reach shallow pans or troughs in which we place a little skim milk or buttermilk, or lacking these a gruel made of water and the meal mixture mentioned. We usually start with shorts and water, adding the coarser meals as the pigs become older. We have had most excellent results from the addition of oil meal to the young pig's rations. By this

method the young pigs are early encouraged to eat, so that when weaning time comes there is no check to their growth. We feed no corn until the pigs are 3 months' old. By this treatment, coupled with plenty of yard exercise, they develop good healthy frames."

THE HORSE AND HIS FOOD.

In feeding horses very few stop to think that their stomachs are small and that they cannot stow away as much forage as ruminating animals of their size, but notwithstanding this most farm horses have their racks stuffed with hay two or three times a day—getting all they will eat. This is apt to produce an uncomfortable distention of the stomach, flatulence, indigestion, weakness, laziness and sometimes founder. As a rule it is cheaper and every way better to feed horses less hay and more grain. It is the height of folly for a farmer to scrimp the allowance of oats and stuff the horse with hay.

While twice a day is often enough to feed ruminating animals horses should be fed three times. Cattle have large storage capacity They can bolt the food as fast as they can wad it down and afterwards regurgitate it and masticate it at their leisure. But the horse, not having this power, requires to be fed often and less at a time. A work horse should not be fed hay at noon, as he must carry it around all afternoon undigested. At noon feed him a good allowance of grain only. He thus gets the requisite amount of nutriment in a more concentrated form. About 14 pounds of hay a day is all a horse should have. Make the rest of his ration some kind of grain. Feeding too much hay often causes heaves. Liverymen have generally learned how to feed work horses. They feed very little hay, some none but a small quantity of straw instead to add bulk to the ration of grain.

REDUCE THE AMOUNT OF FODDER FED TO HORSES.

Few stockmen, in their feeding operations, take into account the widely differing structure of the stomachs of the various farm animals. The stomach of ruminants consists of four divisions, whereas the horse has but a single sac.

As a result of this difference, digestion with a horse is a much simpler matter mechanically than with a cow, though chemically the results are similar. With the horse the food is not returned to the mouth, as is the case with ruminants, but as soon as swallowed, is brought under the action of the gastric juice.

The following table gives a comparison of the intestines and stomach of the horse and cow:

	Horse.	Cow.
Average capacity stomach	19 quarts	266.9 quarts.
Average capacity small intestines	67.4 "	69.7 "
Average capacity large intestines	137.4 "	40.1 "
Average length small intestines	73.6 feet.	150.9 feet
Average length large intestines	24.5 "	36.3 "

THIS STYLE OF HORSE IS A GOOD SELLER.

This elementary knowledge of the anatomy and physiology of the stomach of the horse should suggest to the feeder that a large ingestion of hay or coarse fodder of any kind by the horse will result in disorders of the digestive organs.

Experiments have been made which show that horses have a "uniformly lower digestive efficiency than ruminants." The horse dissolves less crude fiber than the steer or sheep, and this peculiarity is more marked in the case of the crude fiber of fodder crops than in the grains. These considerations led us to the conclusion that too much hay was being fed at the Station barn.—*Utah Bul.*

READ AT THE ROCKINGHAM INSTITUTE.

THE MOST PROFITABLE HORSE FOR THE FARMER.

Mr. Chairman and Brother Farmers of Rockingham County:

I was asked some weeks ago by one who had the management of this meeting in charge to prepare a paper on the above subject. I do not quite understand why I was thought to be able to give you anything of special profit, as my experience in this matter has not been of sufficient length to arrive at absolute judgments along this line; but the deep interest that I have put in the matter in these late years had led me to study the important subject of horse-raising, and if the few observations that I am able to make here arouse the same interest in your minds and lead you to think along this line, this paper will not have been in vain.

The farmers generally of this county have been slow to look at their business in a scientific light. There is too much of hap-hazzard sowing and reaping and not enough of the thoughtful, careful attending to crops and stock.

Now to the question, What kind of a horse does the farmer need? First, he must have one suited to the heavy labor of the farm; and second, he must have one which will bring him most profit on the market. Now in what horse may you find this combination? In studying these two requirements, one must say the heavy draft animal.

In this land of hills, bad roads, rocks and heavy clay soil, the heavy draft is the only horse by which the farmer can do his work well. On every hand the demand is for heavy work. The farming machinery must be drawn over the hills, the crops must be transported to market over these same hills, and often over a mud road, at the time of year when they are simply wretched, as is the case this spring. But the greater reason for the heavy draft horse being the one for the farmer is the profit to be had out of him on the market.

It is very fortunate that he is so valuable as a money-maker and at the same time the very animal the farmer needs for his work. The heavy draft colt, with the proper care and attention, will at the tender age of two and one-half years, earn his feed, do it easily, and at the same time not hinder his free and full development. Take the light draft horses and at the same age require the same work, and you will not only find him not able for it, but you will retard his growth and thereby ruin him for the purpose he was intended.

The price paid on the market for the heavy draft animal is the point that

especially interests the farmer at this time. There was a time in the history of farming in this county when the wheat crop was the great means of profit and income to the farmer, but that time is past. New countries opening up into this industry, improved methods of sowing, harvesting and transporting the crop have taken away the profit in raising wheat in the East. It is true that the hay crop has been a paying one for the last few years, but selling hay from the farm has its objections—robbing the farm of that which enriches it. By feeding hay to profitable stock you will get the same income from it, besides the manure with which you may replace the strength that the crop took from the soil. The fact that the draft colt earns his living so soon makes him inexpensive to the farmer, and the top prices received for him make him the most profitable for the farmer. The horse that is bred for a special purpose is the one that is in demand, and it only takes a visit to one of our many cities to learn what kind of a horse is in demand. The immense business of the breweries and transportation companies of the cities will have nothing else than the heaviest of draft horses. The logging and lumbering companies want nothing but the best of the draft type and for export only the horses bred for a special purpose are purchased.

From the above statement of facts as to the demand for horses in this country, one can readily see that the heavy draft will command the highest prices. The recognized draft breeds, such as Percheron, Clydesdale and Shires, bring anywhere from $100 to $250; those from two to three years old readily sell for $100 to $175, and the fully matured will bring on our home markets from $150 to $250. Take the ordinary horse, such as you may find all over the country drugging the market, and so far as expense of raising is concerned, it would cost just as much as to raise a well-bred heavy draft horse, but on our markets anywhere the heavy draft will bring on an average $75 more money. It may readily be seen from these facts and figures that the heavy draft horse is the one suited to the farmer of this country. It is estimated that the farmers and graziers of West Virginia lose annually the great sum of three million dollars by breeding, buying and grazing scrub stock.

Not long since I attended a public sale of personal property where a number of colts of light draft were sold. The prices received did not pay for raising them. Let me call attention to another sale which is fresh in your minds, when a prominent stock dealer and farmer of this county made a sale of ten heavy draft horses for the notable sum of $2,300. These horses were bought of farmers who were shrewd enough to breed to pure-bred draft sires and thereby reaped a profitable reward. Let me say just here that the breeding of good horses should be better understood by our farmers. The different breeds and types of horses were not originated in a day or even a year, but hundreds of years. Improvement has gone steadily on, until we now have all breeds highly improved. It might be interesting to note that all registered thoroughbreds trace their pedigree back to the original Arabian horse, which is noted in history.

If the farmers would give more attention to this part of their work we would have a better class of horses and more profit would come from stock-raising and a great demand would be filled from our country.

Of course, there are some farmers who naturally like to give their attention

THIS STYLE DRAFT HORSE IS IN STRONG DEMAND.

to other breeds, such as Hackneys, thoroughbred, standard-bred coach, etc. These special-bred horses, when trained, bring fancy prices, but the average farmer has no time for training, therefore the heavy draft is especially suited to his needs.

The great means to educate the farmers along the line of improving their lands and stock are the Horse Shows, Agricultural Fairs and Farmers' Institutes, like the one we are now engaged in.

F. A. HEATWOOLE.

A CRITICAL STUDY OF GETTYS' METHOD OF GROWING COW-PEAS FOR SILAGE PURPOSES.

Mr. W. Gettys is a prominent and successful dairyman and farmer in Tennessee. All of his conclusions are, therefore, based upon the conditions of atmosphere and soil which rule in his section of that State. He claims—

1. That too much of pea vine silage may somewhat unfavorably affect the flavor of milk.

2. That properly grown and matured pea vine, evenly mixed in the silo with an equal portion of corn and fed in connection with good hay or other provender, will produce milk and butter of first-class quality.

3. That of all tested varieties of peas the whippoorwill is best for silage, if grown in conjunction with corn. For in his climate it yields more grain and ripens its vine more uniformly than the ranker growing running varieties; it damages the corn less and renders the harvesting less difficult, as it confines its growth in great measure to the corn row in which it is seeded.

4. Corn for this combination crop is preferably a large Southern variety, drilled in rows four and one-half feet apart, with stalks at intervals of from nine to sixteen inches in the row. Planting time for corn, the middle of May; for peas, during the first week in June, after the corn is six inches high, and after it has been cultivated once. One row of seed peas only is planted for each row of corn, and is drilled as close to the corn as possible, permitting the use of the corn harvester and thereby insuring uniform distribution of corn and pea vine in the silo. Silo filling may be begun on or about September 8th. Four mules are necessary in order to operate the corn harvester easily and expeditiously. The product is bound into bundles, and causes no delay in passing it through the silage cutter. This work is in fact so rapid that two men in the silo, four two-horse teams on a half-mile haul, and three loaders are essential in order to avoid delays.

5. Silage thus made keeps well, is relished by the cows, which eat of it forty pounds daily in two feeds. Four quarts of bran, two quarts of corn meal and one pound of cotton seed meal is added each night and morning, and at noon a ration of corn stalks with dried pea vine grown thereon is given.

6 No crop of field corn intended for cribbing should be planted without the addition of seed peas in each hill; with the corn harvester to use in cutting up for shocking, and the corn husker and shredder for subsequent work, the separation of ears and of the seed peas from each other and from the corn and pea vine fodder, can be quickly and economically carried out.

To guard against mouldy fodder prior to husking, it is advisable to go through the field three days in advance of the harvester and make small shocks which will give a dry nucleus or centre to the main shock. To guard

against the moulding of shredded fodder in the mow, husking should be delayed until late in November or early in December; to prevent the moulding of pea seed admixed with kernels of corn shattered from the cob by the pinching rollers of the husker, spread the grain on the garner floor to dry for a few days before sacking it.

The first tests in Delaware of this method of cropping were made in 1900 by the late John Dennison and by the writer.

Mr. Dennison's silage corn was planted early in May and seed of the Black pea were drilled along each corn row. These rows were three feet six inches apart; the soil was very rich and the corn had too much start. The peas stood well, but few of them reached the corn ear, owing to the dense shade. The corn crop was very heavy, but the proportion of pea vine in it at harvest time was too small to be considered.

The writer pastured one acre of rye until early in June. On the 10th of that month the ground was plowed and Early Bristol seed corn was drilled in rows three feet nine inches apart. This variety of corn matures within ninety days after planting. On June 23d the corn plants were large enough to stand cultivation and whippoorwill seed peas were drilled with the corn planter along each corn row. This crop was cut for silage on September 21st It yielded 16 tons 150 pounds per acre. The pea vines had grown with the corn which stood about eleven feet tall; all over the field the vine could be seen above the tops of the corn tassels. The McCormick Corn Harvester was used and did its work in a thoroughly satisfactory manner, even when drawn by a pair of medium-weight horses. The silage cutter, however, was a small one, twenty-five tons per day of ten hours being the limit of its capacity; hence the field work was not crowded. This harvester was set to make the smallest bundles possible. A number of these taken at random from loads at the cutter were weighed and found to average thirty-eight pounds each. These bundles were opened, the pea vine was cut away from the stalks and each was weighed separately. By this means it was found that the crop was made up of 24 per cent. of vine and 76 per cent. of corn. This result was a surprise, for a larger proportion of vine was expected and desired. One bundle was found in which the vine formed 56 per cent. and the corn 44 per cent.; this was, however, admitted to have been cut from a section of a row where the corn stood badly and the peas had an abundance of sunlight and food. Very few ripe pods were found in this crop and the question has arisen as to the fitness of the whippoorwill variety for use with ninety day corn.

The above noted crop of 16 tons of corn and peas per acre was raised upon well-manured land. A second test was made upon a plot of four acres, from which a crop of crimson clover had been cut on May 23, 1900. This land was plowed on June 1st and as soon thereafter as possible it was seeded to Early Bristol corn. The crop did not thrive for the corn root louse infested this field. On June 22 Whippoorwill peas were seeded along each corn row. This field was cultivated frequently until the tassel developed on July 28th. Upon replanted corn the peas grew to the tassel but upon the original stand, few vines were seen very much above the corn ear. This crop was cut on September 18th and the total yield was 9 tons 1,268 pounds per acre.—*Bulletin No. 55.*

TURPENTINE FOR BLOAT.

"We have used, upon our own stock and that of our neighbors, a remedy which has always given satisfactory results, and that is spirits of turpentine," says a correspondent in *Prairie Farmer*. "The dose is from 1 to 5 common-sized tablespoonfuls, according to the age of the animal. It should be mixed with about an equal quantity of milk or water; milk is preferable, as the turpentine is oily and does not mix readily with water. The reason for diluting the turpentine is that it is a little harsh and burns the animal's throat if given clear. I have the utmost confidence in my remedy, so much so that if I can have the animals while they have 20 minutes of life left I will insure them for 20 cents. There is no disease about them! it is simply an accumulation of gas in the stomach and paunch, and these become so distended that they crowd the lungs so they cannot expand and the animal drops dead for want of breath. If anything is to be done for them it must be done before they go down for they are practically dead before they fall."

A HOG LOUSE TRAP.

A large oak post one an one-half to two feet high is set in the hog lot. A two-inch hole is bored from the top down to within eight inches of the ground. Holes are bored from the sides, tapping the vertical hole at the bottom. The holes are stopped up with pine plugs. The post is next wrapped with burlap, the vertical hole is filled with kerosene, and plugged tightly to exclude all dirt. The kerosene will seep out through the pine plugs and saturate the burlap bandage and the pigs will thus saturate themselves with the kerosene, and the hog-lice infesting them will be killed.—*Up-to-Date.*

ROCKINGHAM INSTITUTE.

CATTLE FEEDING.

This is one of the necessary side lines to farming, and should commend itself to every farmer who tries to grow two blades of grass instead of one. It is the means by which all forage can be converted into the best of manure. No other stock will make as general a clean up of all forage, hay and grain, and yield as good returns for same, as good cattle with good attention, and if the manure be well cared for the farm is being made more fertile thereby; and soil fertility is the grave question that confronts every thinking farmer today, for surely if we would have the farm feed us we must first feed the farm.

No man should attempt to feed cattle without first studying their needs and making preparation to supply them. In this work, like many others, there are many things that can be learned only by practical experience and the same watchfulness is required that guarantees success in other lines of work.

Four things are essential to success in cattle feeding: First, good cattle; second, plenty good feed and water; third, a good feeder, and fourth, a proper place to feed.

As to breeds of beef cattle, the Poland Angus stands first, he is the best of eaters, always ready for his feed, and will lay on more fat in less time with same amount of feed than any other known. He also shows a greater per cent. of dressed meat, which makes him the best of sellers.

The Short Horn makes enormous growth, but is not as easily finished, and is often inclined to be too tall and course to sell to the best advantage.

The Herefords are noted for their close, compact frames and their inclination to fatten at any age, but when put in yard on full feed will bolt their feed quicker and show weaker constitutions than either of the above breeds, while a cross with a Short Horn and Hereford is preferable for a feeder to a full blood of either.

Second. With cattle feeding corn is king, yet to corn should be added an abundance of good clover and timothy hay and plenty of shorts and bran; the more clover hay you have the less bran you will need.

After corn is dry enough to crib, it is much cheaper to have miller grind than to try to make cattle grind it.

A good feed may be had by mixing 2 bushels cob meal (ground coarse), 1 bushel bran and 1 bushel shorts, and a good healthy steer weighing 1,000 pounds will consume I peck of this mixture twice per day, with lots of good hay besides; but nothing definite can be given for the consumption of a steer, as that must be determined by the steer himself. Noon is the best time to feed fodder to stabled cattle; shredded is best, cattle get more good of it, what is not eaten makes better bedding and finer manure. Hay should be kept in reach at all times, for if you want cattle to fatten they must be kept full at all times, and don't expect them to do this on hay and shredded fodder alone—corn must be king. Cattle should have access to plenty of good clean water at all times.

Third. The one who feeds the cattle should be regular at his place in all kinds of weather, study their individual wants and be ever ready to administer to them. The wildest steer can often be tamed by quietly handing him an ear of corn until he learns to know the feeder is his best friend, and he will be the first to follow him.

They should be fed by the same man at all times, if possible. The loud, rough, noisy man is as much out of place among a bunch of fattening cattle as a political leader in a church choir.

Fourth. A proper place to feed is very necessary, for you may have good cattle, plenty good feed and an excellent feeder, but if your cattle are compelled to stand in the mud knee deep and eat their feed, having no shelter or dry place to lay down they will certainly not yield good returns for feed. Often do we see men feeding same amount of feed, and the man who carefully shelters his cattle gets twice the increase in weight over the one who does not shelter.

If you can't stable, shed your cattle; a lot of dehorned cattle will feed in a very small place, in shed, and cattle should be dehorned that are to be fed. It is said that cattle shrink but little from dehorning, but always try and get the other fellow to dehorn them before you get them.

To get the best results from feeding cattle, treat your cattle as you would your honored guest; surely you would not think of feasting them three times a day and then giving them an uncomfortable bed.

A VIRGINIA BLUE GRASS PASTURE—EXPORT BEEVES.

Don't do your cattle that way; they will show as much appreciation of a good dry bed as your guests, and yield far better returns.

To feed well takes lots of work, but it is always the extra labor that pays best. Young man, if you would have that old farm blossom as the rose, feed cattle, for by so doing you will get good prices for all your farm products, and if you carefully husband your manure you will have an abundance of farm products. In the last ten years clover hay has brought far more when marketed through the well-bred steer than when marketed by the hay dealer and the farm is in far better shape to produce when marketed in this way than when all farm products are shipped.

Remember, when you raise big crops by heavy applications of commercial fertilizer and selling all crops you impoverish the soil; while with continual application of good manure, you greatly increase said fertility, or in other words have greatly increased your capital stock and also increased its earning capacity, for surely it is less labor and expense to harvest 30 bushels of wheat from one than two acres. W. C. HOOVER.

Timberville, Va.

ECONOMY AND PROFIT IN FEEDING STOCK.

To get all of the profit out of his feed, the farmer is compelled to feed intelligently. A great amount of profit is often lost by the farmer by feeding contrary to Nature's laws. There are some constituents in feed that Nature made to make blood, muscle, bone and growth in animals, and there are other constituents that Nature made to make heat, give energy and lay on fat in animals. The animal cannot make blood, muscle and bone out of the carbohydrates, neither can it make fat, heat and energy out of protein—no more so than a plant can make potash out of nitrogen. These important facts are not understood by many farmers; this article is made as plain and simple as possible in the hope of aiding them in studying this subject. In the report for last year a colored feeding chart was given, giving the analyses of some of the usual feeds grown in this State, showing the different constituents in the feeds by colors. There are no feeds composed exactly of the same amount of protein, carbohydrates and fat; all feeds contain these constituents, but in different proportions, so when the feeder ascertains what his feeds are composed of and what each constituent is intended for by Nature, the next fact the intelligent feeder desires to know is how much of these different constituents are digestible by the animal and how much is required. Experiments have shown that the animal can digest more of the protein (the blood, muscle and bone and milk makers) and the carbohydrates and fat (the heat, energy and fat makers) in some feeds than in others. A table is given showing the number of pounds of each of these constituents that is digestible in each 100 pounds of feed. The value of a feed depends upon the amount of digestible protein, carbohydrates and fat it contains. So the farmer is concerned mainly in only two kinds of feed—the muscle-forming feeds, such as wheat, bran, or gluten feed, cotton seed meal, oats and clover hay, pea hay, etc., which is most profitably fed largely to young and growing stock and for the production of milk; the carbohydrates, the fat-making feed, such as corn, timothy hay, corn fodder, potatoes and any starchy feed, are the fat-makers.

Table showing the number of pounds of digestible protein and carbohydrates in each 100 pounds of the following feeds:

NAME OF FEED.	Dry matter in 100 Lbs.	Digest. Nutrients in 100 Lbs.		
		Protein	Carbohydrates	Fat.
Concentrates—	lbs.	lbs.	lbs.	lbs.
Corn, all analyses	89.1	7.9	66.7	4.3
Corn and cob meal	84.9	4.4	60.0	2.9
Wheat bran	88.1	12.2	39.2	2.7
Wheat shorts	88.2	12.2	50.0	3.8
Wheat middlings	87.9	12.8	53.0	3.4
Wheat screenings	88.4	9.8	51.0	2.2
Rye	88.4	9.9	67.6	1.1
Rye shorts	90.7	11.9	45.1	1.6
Oats	89.0	9.2	47.3	4.2
Oat meal	92.1	11.5	52.1	5.9
Oat feed or shorts	92.3	12.5	46.9	2.8
Sorghum seed	87.2	7.0	52.1	3.1
Broom corn seed	85.9	7.4	48.3	2.9
Millet	86.0	8.9	45.0	3.2
Linseed meal, old process	90.8	29.3	32.7	7.0
Linseed meal, new process	89.9	28.2	40.1	2.8
Cotton seed	89.7	12.5	30.0	17.3
Cotton seed meal	91.8	37.2	16.9	12.2
Cotton seed hulls	88.9	0.3	33.1	1.7
Sunflower seed cakes	91.8	31.2	19.6	12.8
Peanut meal	89.3	42.9	22.8	6.9
Soja (Soy) bean	89.2	29.6	22.3	14.4
Cowpea	85.2	18.3	54.2	1.1
Roughage—				
Fodder corn, green	20.7	1.0	11.6	0.4
Fodder corn, field cured	57.8	2.5	34.6	1.2
Corn stover, field cured	59.5	1.7	32.4	0.7
Fresh Grass—				
Pasture grasses	20.0	2.5	10.2	0.5
Timothy, different stages	38.4	1.2	19.1	0.6
Orchard grass, in bloom	27.0	1.5	11.4	0.5
Redtop, in bloom	34.7	2.1	21.2	0.6
Sorghum	20.6	0.6	12.2	0.4
Vetch	25.2	4.4	9.2	0.7
Hay—				
Timothy	86.8	2.8	43.4	1.4
Orchard grass	90.1	4.9	42.3	1.4
Redtop	91.1	4.8	46.9	1.0
Soja bean hay	88.7	10.8	38.7	1.5
Oat hay	91.1	4.3	46.4	1.5
Marsh or swamp hay	88.4	2.4	29.9	0.9
Crabgrass hay	89.7	2.2	42.8	0.6
Bermuda grass hay	86.0	6.9	39.0	0.8
Johnson grass	85.7	6.0	41.4	1.2

NAME OF FEED.	Dry matter in 100 Lbs.	Digest. Nutrients in 100 Lbs.		
		Protein	Carbo-hydrates	Fat.
Straw—	lbs.	lbs.	lbs.	lbs.
Wheat	90.4	0.4	36.3	0.4
Rye	92.9	0.6	40.6	0.4
Oat	90.8	1.2	38.6	0.8
Wheat chaff	85.7	0.3	23.3	0.5
Oat chaff	85.7	1.5	33.0	0.7
Green Legumes—				
Red clover, different stages	29.2	2.9	14.8	0.7
Alsike, in bloom	25.2	2.7	13.1	0.6
Crimson clover	19.1	2.4	9.1	0.5
Alfalfa	28.2	3.9	12.7	0.5
Cowpea	16 4	1.8	8.7	0.2
Soja bean	24.9	3.2	11.0	0.5
Legume, Hay and Straw—				
Red clover, medium	84.7	6.8	35.8	1.7
Red clover, mammoth	78.8	5.7	32 0	1.9
Alsike clover	90.3	8.4	42.5	1.5
Crimson clover	90.4	10.5	34.9	1.2
Japan clover	86.0	7.8	41.4	1.8
Peanut hay	92.4	6.7	42.1	3.4
Alfalfa	91.6	11.0	39.6	1.2
Cowpea	89.3	10.8	38.6	1.1
Soja b an straw	89.9	2.3	40.0	1.0
Peavine straw	86.4	4.3	32.3	0.8
Vetch hay	83.3	14.6	30.6	2.3
Silage—				
Corn	20.9	0.9	11.3	0.7
Clover	28.0	2.0	13.5	1.0
Sorghum	23.9	0.6	14.9	0.2
Alfalfa	27.5	3.0	8.5	1.9
Cowpea vine	20.7	1.5	8.6	0.9
Soja bean	25.8	2.7	8.7	1.3
Roots and Tubers—				
Potatoes (sweet)	28.9	0.9	22.2	0.3
Beet, common	13.0	1.2	8.8	0.1
Beet, sugar	13.5	1.1	10.2	0.1
Beet, mangel	9.1	1.1	5.4	0.1
Flat turnip	9.5	1.0	7.2	0.2
Ruta baga	11.4	1.0	8.1	0.2
Artichoke	20.0	2.0	16.8	0.2
Miscellaneous—				
Cabbage	15.3	1.8	8.2	0.4
Sugar beet leaves	12.0	1.7	4.6	0.2
Pumpkin, field	9.1	1.0	5.8	0.3
Pumpkin, garden	19.2	1.4	8.3	0.8
Cow's milk	12.8	3.6	4.9	3.7
Skim milk, gravity	9.6	3.1	4.7	0.8
Buttermilk	9.9	3.9	4.0	1.1
Whey	6.6	0.8	4.7	0.3

USE OF TABLE.

It has been found by practice and experiments, that an animal of 1,000 pounds live weight will require a certain amount of protein, carbohydrates and fat, in order to do a certain amount of work. This work may be actual labor, putting on fat or giving milk. Then the more work the animal is required to do, the more food it will require, just as a large crop requires plenty of plant food to produce it. The table below gives the feeding standards for different animals. The standards as given are not absolutely correct, but they serve as guides. The reason why they are not absolutely correct is that some animals will make better use of the food given them than others of like weight; in other words, they may have the power of digesting more of a given amount of food than other animals. Breed has nothing to do with the ability of an animal to digest food.

ANIMAL.	Per day per 1000 lbs. live weight.				
	Dry matter.	Digestible Nutrients.			
		Protein.	Carbohydrates	Ether Extract	Nutritive Ratio, 1.
	lbs.	lbs.	lbs.	lbs.	lbs.
1. Fattening Cattle—					
First period	30.	2.5	15.0	0.5	6.5
Second period	30.	3.0	14.5	0.7	5.4
Third period	26.	2.7	15.0	0.7	6.2
2. Milch Cows, when yielding daily—					
11.0 lbs. of milk,	25.	1.6	10.0	0.3	6.7
16.6 lbs. of milk	27.	2.0	11.0	0.4	6.0
22.0 lbs. of milk	29.	2.5	13.0	0.5	5.7
27.5 lbs. of milk	32.	3.3	13.0	0.8	4.5
3. Sheep—					
Coarse wool	20.	1.2	10.5	0.2	9.1
Fine wool	23.	1.5	12.0	0.3	8.5
4. Horses—					
Light work	20.	1.5	9.5	0.4	7.0
Heavy work	26.	2.5	13.3	0.8	6.0
5. Brood sows	22.	2.5	15.5	0.4	6.6
6. Fattening Swine—					
First period	36.	4.5	25.0	0.7	5.9
Second period	32.	4.0	24.0	0 5	6.3
Third period	25.	2.7	18.0	0.4	7.0
7. Growing Fattening Swine—					
Age 2-3 mo. 50 lbs	44.	7.6	28.0	1.0	4.0
3-5 mo. 100 lbs	35.	5.0	23.1	0.8	5.0
5-6 mo. 150 lbs	33.	4 3	22.3	0.6	5.5
6-8 mo. 200 lbs	30.	3.6	20.5	0.4	6.0
9-12 mo. 300 lbs	26.	3.0	18.3	0.3	6.4

Now, in the standard we say that a milch cow of 1,000 pounds live weight, giving 22 pounds of milk per day, will require 29 pounds of dry matter containing 2.5 pounds of digestible protein, 13.0 pounds of digestible carbohy-

drates and 0.5 pounds of fat each 24 hours. In order to get the proper amounts of each, it is necessary to have a combination of foods. You notice that the standard calls for 29 pounds of dry matter; this is necessary in order to insure sufficient bulk to the ration. The cow will not make the best use of the food if it is all supplied in a concentrated form.

In order that we may have a clear idea of the construction of rations, let us suppose we want to construct a ration for the cow mentioned above. We will take some of the common feeding stuffs—say corn silage, bran, cotton seed meal, corn meal and hulls. We will take as a trial ration corn silage, 30 pounds; bran, 6 pounds; cotton seed meal, 3 pounds, and corn meal, 4 pounds. Looking these up in the table, we find that corn silage contains 20.9 per cent. of dry matter; then in the 30 pounds of silage we will have 6.27 pounds of dry matter. We find that it contains 0.9 per cent. of protein; then in the 30 pounds we will have 0.27 pounds of protein. We find that it contains 13.3 per cent. of carbohydrates; in the 30 pounds then there will be 3.39 pounds of digestible carbohydrates, and since corn silage contains 0.7 per cent. of fat, there will be 0.21 pounds of fat in the 30 pounds. If we work all of them out in this way, and put them down in tabular form, we will have the following as a trial ration:

Kind of Feed.	Wt.	Pounds of Dry Mat.	Pounds of Protein.	Pounds of Carbot'es.	Pounds of Fat.
Corn silage	30	6.27	0.27	3.39	0.21
Bran	6	5.29	0.74	2.35	0.16
Cotton seed meal	3	2.75	1.12	0.51	0.37
Corn meal	4	3.56	0.32	2.67	0.09
Total		17.87	2.45	8.92	0.83

Comparing this with the standard, we find:

	Pounds of Dry Mrt.	Pounds of Protein.	Pounds of Carbot'es.	Pounds of Fat.
Standard	29.0	2.5	13.0	0.5
Proposed ration	17.87	2.45	8.92	0.83
Difference	—11.13	—0.05	—4.08	-|-0.33

Thus we see that we need about 11 pounds of dry matter, 4.08 pounds of digestible carbohydrates, and a very small amount of protein to bring the ration up to the standard, but we have 0.33 pounds of fat too much. We will not bother about this excess of fat, as the carbohydrates are still too low. In order to bring the ration up to the standard, we will try 12 pounds of hulls. Adding this to the proposed ration, we have:

	Pounds of Dry Mat.	Pounds of Protein.	Pounds of Carbot'es.	Pounds of Fat.
Proposed ration	17.87	2.45	8.92	0.83
C. S. hulls, 12 lbs.	10.67	0.04	3.97	0.20
Total	28.54	2.49	12.89	1.03

This brings the ration sufficiently near the standard for all practical purposes. As said above, the standard is nothing more than a guide. You may find from experience that your animals will do better on slightly more protein than is given in the standard. Experience should be combined with the use of the standard.

Remember that the above ration is for an animal of 1,000 pounds live weight. If your animal is larger or smaller, vary the amount of the ration to suit the size. Judgment must be exercised in selecting the kinds of food to use; for example, cotton seed meal should not be used to supply protein to young calves or pigs.

In feeding dairy cows, it is well to have a variety of food, so that the cows will not tire of any one kind. The object in feeding the dairy cow or the fattening steer is to convert the raw product of the farm into milk and butter or beef. It takes a certain amount of food to keep up the body. This must be supplied before any milk or fat can be made. All over and above what the animal requires to maintain the body is converted into profit to the feeder. It is evident then that the more you can get the animal to eat and digest, the greater profit it will return.

The palatability of the food should be taken into consideration. It makes no difference how high a feeding value a plant may have, if it is not palatable. A very small amount of food that an animal is fond of mixed with other food of which she is not fond, will sometimes make the whole more palatable. For example, a little green rye mixed with the other food in the spring will make the food more palatable.—*South Carolina Bulletin, No.* 67.

HOG-RAISING IN NOTTOWAY COUNTY, VA., FOR PROFIT.

The old custom of raising hogs in Virginia, feeding nothing but corn, was costly meat to the farmer, especially where land is thin. By trying peas, wheat, artichokes and clover I find meat can be raised very cheaply. I sow peas and sugar cane in May; these I let begin to ripen, which will be in August. The hogs are then turned into the field. This will last them until November, or, perhaps, December. They are next turned on artichokes; they will do well on these until April, with the addition of a small amount of grain. From this they are turned on clover; then about the first of June they are put on wheat, which will last until peas come again. By this rotation of crops, it will cheapen the meat-production of our State. Turnips, for winter, with the artichokes, will be a great help. I am confident meat can be raised, in this way, from two to three cents per pound. T. O. SANDY.

Burkeville, Va.

LIVE STOCK RECEIPTS.

Live stock received at the Stock-Yard, city of Richmond, during the last twelve months from October, 1901, to October, 1902:

Cattle, 19,819; calves, 4,145; sheep, 19,893; hogs, 23,321; horses, 6,000; mules, 4,000.

Received at city of Norfolk, Va., Stock-Yards:

Cattle, 3,543; calves, 1,166; sheep, 4,226; hogs, 1,320; horses, 10,841; mules, 5,030; goats, 89.

SOME OF T. O. SANDY'S HOGS RAISED ON PEAS AND SORGHUM

THAT WEANLING COLT.

Once more we plead for that weanling colt. It has lived fine all summer. homesick at times, wondering why its mother did not come in to appease its hunger, wondering as it looked out of the stable door when the folks would be home from church or from town. It has been weaned now and in many cases has come to the conclusion that it has fallen on hard lines. It has become pessimistic, dyspeptic, with the hair turning the wrong way. It is not doing so badly as yet because it has plenty of grass. If it has to forage for a living in the corn stalk field this winter, or is fed on hay alone, it will be a ruined colt, never realizing its possibilities.

That colt needs some grain, not corn, mind you; or at least not much corn till the weather gets cold; but it needs some of that bleached oats that you have in the barn, not spoiled oats, not moldy oats, but sound, even if discolored oats, for which the dealer will offer you fifteen to twenty cents a bushel. That colt will give you more than the dealer can possibly give you. Let it be eaten from the ground if possible, not from the rack. Why should you fill its eyes with timothy seed, of which there is so much in timothy hay this winter, or fill its lungs with dust? Let it eat naturally. Don't shut it up in the stable as you would a milk cow or even a calf. The colt was made to live out of doors and to exercise. You can't develop it properly in any other way. Give it plenty of oats and clover hay, blue grass pasture if you can, and it will be worth money to you some day. Fail to furnish it feed suitable for it, and you will not make profit enough from that colt to pay for a year's subscription to Wallace's Farmer.

SHEEP IN THE GREAT DISMAL SWAMP.

A few years ago, the land on which the flock of sheep is so quietly feeding was a part of the "Great Dismal Swamp." It was covered with "reeds," water and heavy timber. It was as swampy a tract of land as the most swampy portion of the swamp at present.

The present owner cleared, drained and redeemed this land—3,000 acres of it—and it is now very productive, and so dry that sheep thrive remarkably well on it. The flock was photographed the week before Christmas, 1901, and consists of about 300 ewes, grade Shropshires, and ten registered Shropshire bucks.

There was not a sick, lame or lazy sheep in the flock. To start this flock the owner bought scrub ewes from North Carolina at 75 cents to $1 per head, and using registered sires has graded up, until his flock at present grades high.

The ewes will average four years old, and he raises a certain number of choice ewe lambs each year, and is steadily increasing his flock. The early lambs sell for $4.50 to $5.00 per head, the wool from 20 to 22 cents per pound, and the mutton carcass also brings a good fair price on this market.

To date—Christmas week—the sheep have had no feed from hand whatever. During the ensuing sixty days the old sheep will get a feed of turnips

occasionally and whole corn fodder, stalk, blade, shuck and all. The lambs will get a little ground feed—corn and oats ground together.

The cost of caring for or herding his sheep is about $60.00 per year, no special attention being paid to them excepting during the lambing season. No trouble with dogs, and no disease among the sheep.

The flock was as easily handled as any herd of old milk cows, perfectly docile, and easily rounded up in any part of the field. In the photo the flock is grazing upon timothy sod, which had been mowed twice during the past summer. The stacks in the background is the last cutting.

It was a most interesting sight on this beautiful, crisp, sunny December morning to see the flock grazing easily and contentedly on this timothy sod, on what was, but a few years ago, a portion of the great "Dismal Swamp." The flock was literally and truly as "full as a tick." The cost to keep a sheep in Norfolk county is reduced to the minimum, and the profits are certainly at a maximum, and still this seaport city is receiving annually from Chicago tens of thousands of carcasses of mutton and lamb.

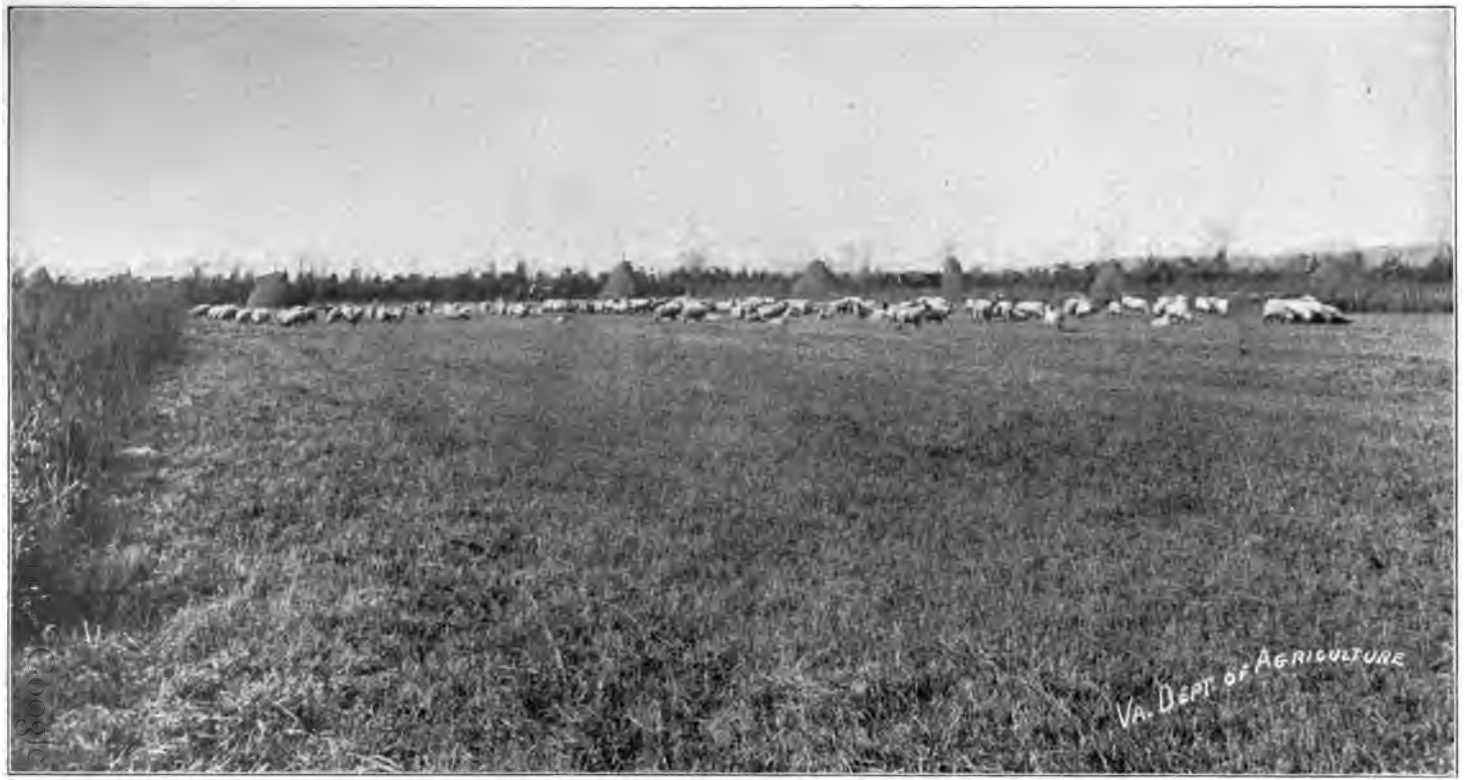
It is a mistaken idea that sheep will not do well on the low lands (Downs) near the sea. They do well in England on such lands, and do well in other countries. Our Norfolk county farmer is demonstrating the fact that the Shropshire Downs do well here. He has been raising sheep for several years and has passed the experimental stage of the business.

The sheep is one of the farmers' very best friends. It is the animal "with the golden hoof" and "never dies in debt to its owner."

We have room within a circle twenty-five miles around Norfolk, for many thousands of sheep, and our farmers and landowners should have the benefit of these quiet, profitable improvers of the soil.

TO CAUSE MANE AND TAIL TO GROW.

To cause a horse's mane and tail to grow, wash in medium salt water frequently.



RAISING SHEEP IN TIDEWATER, VIRGINIA.

SOIL IMPROVEMENT.

THE CHEAPEST WAY THE FARMER CAN MAKE HIS OWN NITROGEN. A VALUABLE ARTICLE.

SOIL INOCULATION FOR LEGUMINOUS PLANTS.

Of the three elements going to make up the value of fertilizers, nitrogen is by far the most expensive. While this element is abundant in nature, forming four-fifths of the atmosphere, it is only under certain rare conditions that this uncombined nitrogen becomes available for plant growth. It has long been known that leguminous plants, such as clover, alfalfa, and cowpeas are unusually rich in nitrogen, and increase the nitrogen content of the soils on which they grow. This was not explained until science brought out the fact that this family of plants is able to obtain nitrogen from the air. It has been found that the power of securing free nitrogen exists only when small nodules or tubercles containing bacteria are found on the roots. It is now generally believed that these bacteria draw their nitrogen from the air and convert it into forms which can be utilized by the plants on which the nodules grow.

In growing these renovating crops for improving the soil it is important to know whether the nodules are formed upon the roots. If they are not there, the greater benefit from growing such crops is lost, and the soil makes no actual gain in nitrogen. Where a crop like clover has been grown at intervals for a series of years, it is probable that the soil will contain the proper bacteria for forming tubercles. It has been found, however, that the bacteria growing upon the roots of one legume, as clover, may not grow upon the roots of another genus, as the cowpea. Therefore, where the nodules are not formed, as is very probable with leguminous plants new to the section where planted, it is advisable in seeding the plants to also sow their proper inoculating bacteria. The absence of root tubercles will probably account for the reported failures of leguminous crops in many sections.

A recent report states that the soy bean has been grown at the Kansas Station since 1890. Only recently, however, have tubercles formed upon the roots, and this was brought about by artificial means. Inoculated soil was obtained from a soy bean field at the Massachusetts Station, and by scattering it over the Kansas land, plants with tubercles were grown, producing an increased yield and a higher percentage of nitrogen. Several methods of inoculating were tried. The seeds were thoroughly wetted in a bag suspended in water, into which the Massachusetts soil had been stirred. Again, the dry soil was sown broadcast over the fields, and in other cases was drilled

with the seed. The best results were obtained by sowing inoculated soil in the drills. The method of securing inoculated soil and of inoculating a field is described as follows: In a 500-foot row incorporate 100 pounds of inoculated soil with the seed at the time of sowing. After harvesting the crop take up the soil in the row to a depth of 4 to 5 inches, spread on boards in the shade until dry, and sack. When planting a field to soy beans apply this soil with the seed by means of a fertilizer attachment to the grain drill.

The Alabama Station has experimented with commercial inoculating material (Nitragin) and inoculated soil on a variety of crops, but especially with hairy vetch and crimson clover as winter-cover crops. It was found that while vetch and clover during the first year developed only a few tubercles on the station soil and made poor growth or failed entirely, they were after a few years of continuous growth abundantly supplied with them and made good growth. However, it would seem hardly profitable to wait for the slow action of natural inoculation when the desired result can be easily and quickly accomplished by artificial means. Where there is a small patch of clover, vetch, or peas, bearing root nodules, a field of a similar crop may be readily inoculated by using soil from the former. At the Alabama Station the crops were inoculated by applying soil from old fields, and by dipping the seed previous to sowing in water into which had been stirred soil from an old garden. Artificial cultures (Nitragin) were also used, but their cost, together with liability to deteriorate, are believed to preclude their use in general farm practice.

In the experiments with hairy vetch grown on a soil for the first time, one lot of seed was dipped into a water solution of earth from an old garden spot where vetch had grown, and another was sown without treatment. The inoculated plants had large clusters of tubercles on the roots and produced 2,540 pounds of cured hay per acre. The uninoculated plants had no tubercles on the roots and produced 232 pounds per acre. The soil of the inoculated plant, besides producing the larger crop, was left in much better mechanical condition. In a crop of crimson clover, seed inoculated with Nitragin produced an average of 4,057 pounds; not inoculated, 761 pounds per acre Not only was the total amount of forage increased in the above instances, but there was a larger percentage of nitrogen in the inoculated plants. The total amounts of nitrogen contained per acre in the crops were as follows: Hairy vetch—inoculated, 105.5 pounds, worth $15; not inoculated, 7 pounds, worth 75 cents. Crimson clover—inoculated, 143.7 pounds, worth $21; not inoculated, 4.3 pounds, worth 60 cents. To buy this nitrogen in commercial fertilizer would cost 15 cents per pound.

In earlier experiments at this station the average increase in weight of the inoculated plants, after thorough drying, was, with hairy vetch, 89 per cent; Canada field peas, 138 per cent; crimson clover (young plants), 146 per cent. In a soil which had not borne leguminous plants for many years, some tubercles developed on hairy vetch, Canada field peas, crimson clover, lupines, cowpeas, and Japan clover (*Lespedeza striata*). Yet, even on this soil the increase in weight of plants by inoculation was with hairy vetch 38 per cent; Canada field peas, 58 per cent, and crimson clover, 79 per cent.

In experiments with hairy vetch at the Mississippi Station the yield was increased 64.6 per cent by scattering inoculated soil in the drills with the seed, and 34 per cent by soaking the seed in water containing the tubercle germs. The amount of nitrogen was also considerably increased by inoculation. The inoculated soil used was obtained from a field bearing hairy vetch which had an abundance of nodules. As regards methods of inoculation, the Mississippi Station makes the following statements:

There are at least three methods of inoculating soil with these germs. One method is to find a field on which a crop of vetch, peas, or clover has grown, on the roots of which an abundance of nodules was developed. In such a case one may be sure that the soil of the old vetch or clover field is full of germs that escaped from the nodules when they decayed. Then draw dirt from this field, about 1 ton to the acre, and scatter as evenly as possible over the one to be inoculated. It should then be quickly harrowed in, especially if it is a hot, clear day, because sunshine kills the germs. The dirt should be taken preferably from 2 to 3 inches below the surface. A second method is to obtain some earth from an old inoculated vetch or clover field, put it in a vessel, and pour water on it. Then stir thoroughly, allow it to settle, and use this water to thoroughly wet the seeds to be sown. The water thus obtained is full of germs from the soil, which will stick to the seeds as they dry. Here again we should use care and not dry the seeds in the sunlight. This [seems to be] the most economical way of inoculating a field. It is not a difficult matter to spread out a bushel or two of clover or vetch seed on an old cloth or tight floor, and sprinkle with plenty of the muddy germ water. The seeds may be left right there until they dry, if they are in the shade, and then are ready to sow. A third method is to buy a material known as Nitragin. This is simply a gelatinous substance full of the germs one wishes to use. It is made in Germany, and consequently in the trip across the ocean and then to us it is very liable to ferment and spoil.

Even if the Nitragin can be obtained in good condition its cost renders its use of doubtful economy, as already stated.

In using inoculated soil it should be borne in mind that while experiments have shown that the germs from one plant will inoculate very closely related plants, and even in some cases those distantly related, the best results will probably be obtained by using germs from the same species of plant as that which it is proposed to inoculate.

It is important to bear in mind that soil inoculation for leguminous plants is most valuable for poor soils deficient in nitrogen, and is not likely to prove profitable on soils abundantly supplied with available nitrogen. In experiments at the North Dakota Station with peas and red clover grown on pure sand, and on a garden soil rich in nitrogen, it was found that inoculation with Nitragin resulted in a largely increased yield in case of the sand, but produced little increase on the garden soil.—*U. S. Department Bulletin*, 121.

HALL OUT THE MANURE.

One of the distinguishing marks of a good farmer is that he keeps his yards clean. No great accumulation of manure is to be found any season

of the year, except, perhaps, in the early spring. He understands that the longer the manure stands in his barnyard the less value it has; that the loss is not so much through leaching as through chemical action going on in the pile, by which ammonia is developed and the nitrogen, which is the most valuable constituent of manure, thereby escapes into the air; that the mineral elements are also leached out, and if the manure stands in the yard six months during the summer season it has lost half its value. Therefore, the proper place for manure is not in the yard, but in the field. The loss there is inconsiderable, not worth counting upon. In fact, when spread upon the field, fermentation cannot take place, and any leaching there maybe goes directly into the soil where it belongs.

There are few farms on which it is necessary to ask the question where this manure can be placed. Anywhere, rather than leave it in the barnyard Preferably, it should be placed on the pastures and on these on the highest parts or on the thinnest places. There is no use putting manure in an undrained slough. If put on the highest parts, any leachings there maybe will tend to go to the lower parts fast enough.

Farmers cannot drop rushing work, such as harvesting, threshing, corn cutting or corn planting, to haul out manure. There are off days and slack times when the manure can be hauled out with little or no interference with the regular work of the farm. The important thing is to keep it out, to understand why it should be kept out, namely, because the worst place of all for it is in the yard; the best place is in the pasture field, but any place is better than to leave it where it is. There will be enough manure accumulate in the yards this winter; therefore, clean it out now before the ground freezes, whenever there is an off time.

A good deal of the effect of manure is wasted if the spreader is not used. Few farmers realize this. By not using a spreader they put on more manure than is necessary; they do not get it on evenly enough. Half of the manure evenly spread is equal in value to the whole of it spread in the very best method possible without the use of the spreader. A spreader costs money, but it pays. It will double the value of the manure on almost any farm. Get a spreader, if you possibly can, but if you can't, keep out the manure anyway.

THE DIGESTION OF MANURE.

Many farmers in applying manure to their land do not stop to think that before this manure can be utilized it must be digested. Digestion is just as essential to plants as to animals; in fact, plants receive their food in a more thoroughly digested way than do even animals themselves.

Nothing grows on the railway track, or highway, covered with burnt clay. This clay may have heat and moisture, may have in it all the essential elements of fertility, and yet no plant will grow on it because it is dead soil. It is dead soil because there is no germ life in it, and there is no germ life in it because there is no decaying vegetable matter of any kind on which germs can feed. These germs are so exceedingly minute that they can be observed only by the most powerful microscopes. A drop of water may contain whole regiments of them, varying in size from one twenty-five-hundredth

to one twenty-five-thousandth of an inch in length. A handful of dirt from any field containing vegetable matter will have millions on millions of them.

A plant can take its nourishment only in a liquid form and the elements of fertility must, therefore, be in the form of a very thin solution in water which can pass through the substance of the minute cells which we call hair roots. It will, therefore, be easily seen how thorough the digestion must be.

There are three different kinds of these minute germs which deal with the nitrogen in manure, roots, or other decaying vegetable matter. The first produces ammonia in the soil, precisely the same thing, only in a very diluted form, which escapes from the pile of decaying horse manure or that is so rank in the sheep barn. Another class combines this ammonia with the oxygen of the air, and forms what is called nitrous acid, which, in combination with earthy matters, forms a salt called nitrite. A third class of these germs converts these nitrites into nitrates, which is the only form in which the plant can use nitrogen. This is soluble and can be easily washed out; hence, the necessity of having the soil as full as possible of growing plants so as to prevent the waste of nitrates by heavy rains.

All this may seem too scientific for the ordinary reader, who will ask: "What have I to do in this business?" We answer him briefly: Drain your wet lands, aerate the land thoroughly by tillage, and give it thorough cultivation. Why? Because these germs require darkness, moisture, air and heat. They are not active under 40 degrees Fahrenheit; they are most active about 98 or 99, and they cease to be active after the temperature reaches over 100. Therefore, the best thing you can do is to stir your ground as early in the spring as possible, and thus warm it up. By stirring frequently we redistribute these germs and bring them into contact with a continual supply of fresh food, and at the same time preserve the moisture without which they cannot thrive.

When the scientist, after all his pains, gets down to the bottom of things, he furnishes a reason why the farmer should do good farming along the lines which the experience of farmers of all ages have found to be correct. The scientist cannot tell us when and how to do things, but he can tell us why, and having told us why, we can easily find out for ourselves how and when.—*Exchange.*

THE VALUE OF HUMUS.

Some experiments in determining the value of humus on soils have been made recently which tend to show that land well supplied with organic matter, humus and nitrates, will help the plants to resist drought better than any others. A field of wheat, oats and vetch was planted, and as different parts of the field were furnished with varying quantities of humus the growth of the plants soon exhibited a patchy appearance. Where the humus was plentiful, the grains were thicker, heavier and much darker in green, showing sturdy vigor, and when dry weather appeared they were scarcely affected by it. But for that matter, any observing farmer has noticed the value of humus on their fields. Take as illustration the patches in the field where a pile of manure has been kept. They will for two seasons produce plants much larger and thriftier than elsewhere. Likewise, under corn stacks or grain stacks,

the soil is enriched by the waste from the stacks, and the shade has accumulated nitrates there. When the field is planted, these places will always be richer in growth than the general field, demonstrating the simple law that the more humus we can accumulate in the soil the heavier will the yield be per acre. Taking such lessons to heart, a thrifty farmer could soon make his whole field produce from ten to thirty per cent. more of crops.

New York. PROF. S. N. DOTY.

FARM YARD MANURE—PARAGRAPHS FROM MY NOTE BOOK.

ITS COMMERCIAL VALUE—ITS EFFECT ON SOILS—ITS WASTE FROM EXPOSURE—HOW TO PRESERVE IT—HOW TO APPLY, ETC.

Manure that has been given good care, *i. e.*, kept from leaching or overheating in the pile, will contain fertilizing ingredients to the value of about $2.75 per ton for horse manure, $2.25 for cow manure, $4.25 for sheep manure, and $3.18 for hog manure.

Each 1,000 pounds weight of horse produces 5.2 cents' worth of manure per day; each 1,000 pounds of cows, 8.2 cents' worth of manure; each 1,000 pounds of sheep, 10.6 cents' worth; and each 1,000 pounds of hogs, 4.7 cents' worth of manure per day. This includes both liquid and solid.

These values are based on the price of equal quantities of fertilizers in the commercial form. But this valuation is not the total actual value of stable manure. Far more valuable are its biological and physical effects on the soil. Manure loosens, sweetens and fines the soil, and produces conditions favorable for the development of the nitrifying organisms, which fix in soluble form the free nitrogen of the air by the aid of leguminous plants.

The ammonia which we so often see and smell escaping contains over eighty per cent. of nitrogen, the most costly element of commercial fertilizers. To prevent the escape of ammonia from the manure heaps and stables, sprinkle them over every day with gypsum (land plaster). But gypsum cannot act freely in fixing this ammonia unless there be a sufficient amount of moisture present in the manure. Horse manure is very dry, and for this reason it is often used in cow stables as an absorbent, becoming mixed with the cow manure, which is very wet. It is sometimes necessary to add water to the horse manure heap and tramp it down firmly to effect a complete abatement in the escape of ammonia.

We must not misconstrue these statements and get the idea that manure left exposed to the weather will be benefited thereby; for after the manure becomes saturated, and water begins to leach away, carrying with it plant food, an equal, if not greater loss is effected by overdoing the matter.

It rests with the judgment of the man to "do the right thing at the right time in the right way." In some parts of the country manure will dry up when left out of doors; in others it will leach away.

If coarse manure is applied late in the spring and plowed under, the result will be that the soil will be very porous and will dry out readily. Should a dry season set in, the manure will become dry and will not decay. Owing to the dryness of the soil alone, a crop on this ground would be a

MAKING HAY IN CHESTERFIELD COUNTY, THIRD YEAR CROP, TWO TONS PER ACRE, PROPERTY OF HON. W. W. BAKER.

failure. Coarse manure should be plowed under in the fall or early spring, so that it will become fined and decayed before dry weather. If it is necessary to apply it late in the spring, apply to the surface and harrow in.

Corn likes a loose, warm soil. One of the best places, therefore, to use coarse, green manure early in spring is on the corn land. Spread it on the surface and plow it under. The manure in decaying throws off heat, and the corn sends its roots deep into the soil.

We should be careful and not plow under fresh manure on the potato ground. It may be plowed under the fall before, and then it will be well rotted when it is time to plant in the spring. When it must be applied in the spring, use it as a top dressing only. In this way we can, to some extent, avoid scabby potatoes.—*Farm Journal.*

THE IMPORTANCE OF CROP ROTATION.

A series of rotations has been carried on for fifteen years at the Missouri and Indiana stations. At the Missouri Station relatively large yields were obtained by this method over continuous cropping. At the Indiana Station the conclusion has been reached that not only can larger crops be secured, but that the fertility of the soil can be better improved by judicious rotations. A comparison of continuous grain growing with the rotation of grain with grass and clover showed a gain by the latter method of six bushels of corn, seven bushels of oats, and six bushels of wheat per acre. The average percentages of gain were for corn 22 per cent., oats 26 per cent., and wheat 44 per cent.

In such systems of farming as sugar production in the South and wheat production in the Northwest, a condition has been reached, even upon land originally of great fertility, where a system of rotation must be employed. In Louisiana the growing of a leguminous crop, like the cowpea, has become a necessity with the sugar planter. The North Dakota Station has taken up the study of a suitable rotation for the wheat farm. Experiments carried on for six years show that continuous wheat culture is unprofitable, while wheat in rotation increases in yield and improves in quality. Three crops of wheat and one of clover gave in four years almost as much wheat and more profitable returns than four crops of wheat in succession. Little was gained in rotating wheat with other cereals, as spring rye, barley, and oats, but wheat after a cultivated crop gave a larger percentage of increase than wheat after summer fallowing, millet, timothy and clover, flax, field peas, or peas and millet. The increase in the wheat crop over wheat after wheat was as follows: After cultivated crops, 75 per cent.; after fallow, 63 per cent.; after millet, 41 per cent.; and after timothy and clover, 33 per cent. When a cultivated crop will only pay for the labor of its production it is better than summer fallowing, as the succeeding wheat crop will show.

The Ohio Station has made a study of the application of fertilizers in rotative croppings. Their experiments indicate that with crops grown continuously the cost of the fertilizer has been greater than the value of the crop produced. Where grains have been grown in rotation with clover, the cost of the fertilizer has been recovered, with a margin to spare. In growing cereals continuously the recovery of the fertilizing ingredients applied is never

in excess of 60 per cent. Nitrogen appears to be the element first exhausted in continuous grain culture. Grains grown in rotation with clover recover the nitrogen applied and a part of that stored up by the clover. The conclusion is reached that at the present prices for grains and fertilizers the use of commercial fertilizers, and even of barnyard manure, if valued on the same basis, is not profitable on wheat, oats and corn, except when those crops are grown in a systematic rotation with clover or some other nitrogen-collecting crop. The poorer the soil the smaller the probability of profitable crops by the use of artificial fertilizers.

The Minnesota Station has studied the effects of the rotation of crops upon the humus content, as well as upon the fertility of the soil. Wheat grown continuously for four years removed annually twenty-five pounds of nitrogen per acre, while 146 pounds more were lost. "This nitrogen was lost by the oxidation of the humus, by denitrification chemically, by wind storms, and through the loss of nitrates by drainage." As a crop of spring wheat occupies the ground during a short portion of the year, it may be seen that during the greater part of the year the other factors are at work in eliminating this element. In a rotation of wheat, clover, wheat, and oats, an average of 178 pounds of nitrogen per acre was removed annually, yet there was a gain for four years over and above this amount of 245 pounds of nitrogen. "This nitrogen, it is believed, has been gained largely by the clover from the free nitrogen of the air." In this rotation not only was the nitrogen and humus content of the soil increased, but larger crops were grown.

With corn grown continuously for four years, the soil lost annually eighty-five pounds of nitrogen. Of this amount only fifty-six pounds were removed by the crop. The annual loss with an oat crop grown continuously was 150 pounds of nitrogen, while only about forty-six pounds were removed by the crop. Barley removed about thirty pounds of nitrogen per acre, and there was lost an additional 190 pounds. With continuous wheat culture there was an annual loss of 1,800 pounds of humus per acre, and with the continuous culture of corn, oats and barley an annual loss of 1,500 pounds. The plats under continuous culture became lighter in color and heavier than those where rotation was practiced. The fallowing of the land resulted in a great loss of nitrogen, as five times as much was rendered available as the crop following could utilize, and the excess was lost by leaching. The gain with clover in a rotation was five bushels of wheat and seventeen bushels of corn per acre.

Any scheme of rotation should have the growing of at least one leguminous crop in its plan. By this means large gains of nitrogen may be made from the air.—*Missouri Report.*

LIME AS A FERTILIZER.

A renewed interest in the use of lime on the soil has been excited by the experiments of the Rhode Island Experiment Station, at Kingston, in which a large increase of certain crops was produced by liming the soil. While the Ohio Experiment Station was located on a gravelly, clay loam at Columbus, experiments in liming were made, but with negative results. This work has recently been undertaken again, however, on the lighter, more sandy clay of

the soil on which the station is now located, and although it has not yet gone far enough to justify positive statements, the present indications are such as to encourage a more extended trial.

In one case a half acre of land on which wheat is being grown, year after year, was treated with a thousand pounds of lime, freshly slaked and applied broadcast just before sowing the wheat. The crop immediately following showed but little effect from the lime; but the second crop showed an increase of about six bushels per acre for the limed portion over the unlimed half acre adjoining.

In another case, half a tract of three acres was limed in the spring of 1900 and planted in corn. There was an apparent increase in the corn crop for the limed part of this tract over that left without lime, and in the oats crop, following the corn, there was a further increase of over nine bushels per acre.

In a third case, part of a block of alfalfa was sown on limed soil and part on unlimed, with the result that the limed portion made by far the more vigorous growth.

One method of applying lime is to pile unslaked lime in small piles on land which has been plowed and harrowed, slack by wetting and covering with earth; then mix thoroughly with loose earth and spread with the shovel. Piles of a peck each, a rod apart, will give forty bushels, or 2,800 pounds per acre, which would be considered a moderate dressing.

Slaked lime cannot be easily applied with the ordinary fertilizer drill, but unslaked lime, ground to coarse meal, is now on the market, and this may be successfully applied in this manner.

The function of lime is not, properly speaking, that of a fertilizer, as its effect is not so much due to the actual plant food which it carries to the soil as to the rendering available of plant food already in the soil, and of improving the physical condition of the soil itself; hence the lime should be as fresh as possible.

In consequence of this effect of lime it should always be followed by liberal manuring or fertilizing, otherwise its use will tend to exhaust the soil; but lime should never be mixed with manure, nor with other fertilizers, especially those containing ammonia, as it will liberate the latter and cause its escape. It should be applied as long as possible before the crop is planted, and is likely to be especially beneficial to clover, timothy and other grasses.

Wooster, Ohio. CHARLES E. THORNE, Director.

THE MAN, OR THE LAND?

One man, with land just like that of his neighbor, "never has any luck." The seasons are all against him, and while his neighbor has good crops, his are apt to be poor. He has an orchard, but seldom has apples, and what he has are of poor sorts and bring little money, while his neighbor has fine trees of the best varieties and makes money out of his apples. We see such cases all over the land, and, as a rule, the men who have such "poor luck" are the ones who do not believe in book farming, and who never read the farm papers, nor attend farmers' institutes. And the saddest part of the whole business is that they cannot see the reason why their reading and thinking neighbors beat them at farming. They imagine that corn is corn, and an apple is an

No. 2—

Acid phosphate	750 lbs.
Cotton seed meal	900 lbs.
Nitrate soda	100 lbs.
Sulphate potash	250 lbs.
Making one ton	2,000 lbs.

Containing ammonia, 4.10 per cent.; potash, 6.25; phosphoric acid, 5.25.

FOR CORN.

No. 3—

Acid phosphate	850 lbs.
Cotton seed meal	700 lbs.
Kainit	450 lbs.
Making one ton	2,000 lbs.

Containing ammonia, 2.80 per cent.; potash, 2.70; phosphoric acid, 5.95.

No. 4—

On a clover sod turned under, or a pea fallow, or where the soil is rich in vegetable matter, the following is a good fertilizer:

Acid phosphate	1,750 lbs.
Muriate potash	250 lbs.
Making one ton	2,000 lbs.

Containing potash, 6.25; phosphoric acid, 12.25.

FOR COTTON.

No. 5—

Acid phosphate	1,200 lbs.
Fish scrap	700 lbs.
Muriate potash	100 lbs.
Making one ton	2,000 lbs.

Containing ammonia, 3.50 per cent.; potash, 2.50; phosphoric acid, 8.4.

FOR WHEAT.

No. 6—

Following clover or peas:

Acid phosphate	1,750 lbs.
Muriate potash	250 lbs.
Making one ton	2,000 lbs.

Containing potash, 6.25 per cent.; phosphoric acid, 12.25.

When some nitrogen is desired, 300 lbs. of dried blood, or 200 lbs. of nitrate soda, may be mixed with the above formula, No. 6.

FOR OATS.

[illegible] the above formula has given good results. [illegible] dried blood or the nitrate soda.

FOR EARLY IRISH POTATOES.

No. 8—

Acid phosphate	950 lbs.
Cotton seed meal	700 lbs.
Nitrate soda	100 lbs.
Sulphate potash	250 lbs.
Making one ton	2,000 lbs.

Containing ammonia, 3.75 per cent.; potash, 6.25; phosphoric acid, 6.65.

FOR LATE IRISH POTATOES.

No. 9—

Acid phosphate	900 lbs.
Cotton seed meal	900 lbs.
Sulphate potash	200 lbs.
Making one ton	2,000 lbs.

Containing ammonia, 3.60 per cent.; potash, 5.00; phosphoric acid, 6.30.

FOR PEANUTS.

No. 10—

Acid phosphate	600 lbs.
Dried blood	1,000 lbs.
Muriate potash	400 lbs.
Making one ton	2,000 lbs.

Containing phosphoric acid, 4.2 per cent.; ammonia, 8.50; potash, 10.00.

FOR CABBAGE, LETTUCE AND CUCUMBERS

No. 11—

Nitrate soda	500 lbs.
Muriate potash	370 lbs.
Cotton seed meal	540 lbs.
Acid phosphate	590 lbs.
Making one ton	2,000 lbs.

Containing ammonia 6; potash, 9; phosphoric acid, 4.

FOR TOMATOES.

No. 12—

Nitrate soda	200 lbs
Cotton seed meal	700 lbs.
Acid phosphate	840 lbs.
Sulphate potash	260 lbs.
Making one ton	2,000 lbs.

Containing ammonia, 5; potash, 7 4; phosphoric acid, 5.

FOR SWEET POTATOES

No. 13—

Nitrate soda	100 lbs.
Fish scrap	400 lbs.
Acid phosphate	1,180 lbs.
Sulphate potash	320 lbs.
Making one ton	2,000 lbs.

Containing ammonia, 3.5; potash, 8; phosphoric acid, 7.8.

FOR BEARING ORCHARDS.

No. 14—

Acid phosphate	1,200 lbs.
Muriate potash	800 lbs.
Making one ton	2,000 lbs.

FOR TOP DRESSING MOWING LANDS IN THE SPRING, SOW TO THE ACRE

No. 15—

Nitrate soda	100 lbs.
Muriate potash	40 lbs.

In mixing fertilizer materials for tobacco always use a high grade sulphate potash; high grade runs 48 to 50 per cent. potash; low grades run about 27 per cent.; never use muriate of potash or kainit for a tobacco fertilizer—it will injure the quality of the tobacco. For Irish potatoes, or any crop that contains sugar, such as strawberries, tomatoes, sugar beets, sweet potatoes, sulphate potash should be used in the fertilizer. A large tobacco grower gave his order for fertilizer, and stipulated that sulphate potash should be used, but when his fertilizer was delivered and analyzed it was found to contain muriate potash. Farmers should be careful to use the kind of fertilizer best suited to his crops. Acid phosphate is South Carolina bone, and nothing less than 14 per cent. should be used.

ASH CONSTITUENTS OF DIFFERENT WOODS, FREE FROM CARBON AND CARBONIC ACID.

AIR DRIED WOOD CONTAINS—*U. S. Dept. Agri.*

	Phos. Acid.	Potash.	Lime.	Magnesia.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Chestnut Bark,	3.25	7.93	47.00	.....
Chestnut Wood,	6.76	10.10	49.19	2.11
Dogwood Wood,	8.51	28.04	38.93	6.80
Hickory Wood,	11.97	28.00	37.94	10.04
Oak Leaves Mixed,	3.35	3.74	29.03	.....
Post Oak Wood,	9.00	21.92	46.39	6.88
Red Oak Bark,	1.63	2.84	50.51	1.81
Red Oak Wood,	10.55	24.66	45.26	5.38
White Oak Bark,	1.24	2 10	53.73	1.62
White Oak Wood,	9.48	42.16	29.85	3.43
Pine Bark, Old Field,	4.88	3.96	27.95	3.10
Pine Wood, Old Field,	4.11	3.85	67.75	6.54
Pine Straw,	4.28	2.08	14.47	0.00
Spent Tan Bark,	1.61	2.04	33.46	3.55
Sumac Waste,	.....	3.25	1.14	3.25 Nitro 1.20

The average ashes in the market is 5 to 6% Potash, and 1 to 2% Phos. Acid.

SEDGE GRASS.

J. D. Beasley, Dows, Tenn.: "Seeing it stated that sedge grass is a sign of bad farming, I write to ask how to get rid of it. It is coming thick in all our pastures, and takes not only the blue grass, but grows in our best bottoms seeded to clover and grass. The question was asked at the Institute at Springfield and not answered. Have heard that to mow it regularly, and not let it seed for several years, will kill it. There is some land in nearly all fields where it does not grow, and some years it is thicker than others. In a graveyard near here, where it was thick fifteen years ago, the blue grass has killed it out. Anything on this subject will be welcomed."

Some have formed the notion from seeing the waving fields of brown broom sedge in the South in the fall months, that it is a sign of exhausted land, simply because it grows so abundantly on the old turned out fields. Broom sedge in the South has been nature's means for curing man's waste. But for the broom sedge and the pine tree a large part of the South would be a howling wilderness. Broom sedge is not partial to poor land, though it will grow there, but, like other grasses, it likes good soil. It is an evidence of bad farming, because if the farm is worked right, there need be no broom sedge. Its presence shows that the farmer is practicing too long a rotation, and is allowing his land to lie in grass till the better grass is run out by the broom sedge. The cure for the broom sedge is a shorter rotation and the use of lime on the land occasionally. The coming in of the sedge on a grass field is a sign that it is time to break that land and cultivate it, manure and grow some renovating legumes on it before turning back to grass. In fact, get the land into condition to grow something better. Its appearance on rich bottom lands recently seeded to clover and grass shows the need of lime more than anything else. Broom sedge does not like lime. while the application of lime on these soils will promote nitrification and the growth of the clover and better grasses. On lands too steep and rough to plow, and which it may be desirable to use as permanent pasture, we have found that Lespadeza striata, or Japan clover, will drive the broom sedge out. We once sowed seed of this on a rock hill pasture among the sedge, and one season was enough to banish the sedge, and for the past fourteen years the Japan clover and grass of various kinds have held that ground against the sedge. With a short rotation, and the use of lime once in five or six years, there is no need to be bothered with sedge.—*Practical Farmer.*

FERTILIZER USED BY DISTRICTS AND COUNTIES.

Amount of fertilizers used in the State, as reported in census for crops 1899. The sales for this year is an increase of about 25 per cent. for the State over the amount reported by the census.

FIRST DISTRICT.

Accomac	$119,100
Northampton	157,400
Lancaster	12,800

Richmond	14,300
Northumberland	26,000
Westmoreland	21,000
Gloucester	9,800
Middlesex	11,800
Mathews	6,400
Essex	10,000
King and Queen	8,300
Caroline	26,700
Spotsylvania	26,200
Total	$459,800

SECOND DISTRICT.

Princess Anne	$ 79,300
Norfolk	308,000
Nansemond	210,000
Isle of Wight	53,500
Southampton	87,800
Elizabeth City	5,800
Warwick	1,900
York	5,800
James City	11,000
Charles City	3,700
Surry	18,200
Total	$785,000

THIRD DISTRICT.

Henrico	$ 29,000
Goochland	12,200
Chesterfield	11,300
New Kent	5,100
King William	11,600
Hanover	41,000
Total	$110,200

FOURTH DISTRICT.

Amelia	$ 33,800
Brunswick	54,200
Dinwiddie	40,800
Greenesville	16,400
Lunenburg	44,500
Mecklenburg	72,500
Nottoway	26,500
Prince George	18,600

Powhatan	16,000
Prince Edward	49,500
Sussex	26,500
Total	$399,300

FIFTH DISTRICT.

Pittsylvania	$190,000
Franklin	34,000
Henry	35,500
Patrick	18,300
Floyd	11,500
Carroll	18,700
Grayson	6,500
Total	$314,500

SIXTH DISTRICT.

Montgomery	$ 14,200
Roanoke	16,400
Bedford	38,700
Campbell	47,800
Halifax	131,800
Charlotte	52,000
Total	$300,900

SEVENTH DISTRICT.

Frederick	$ 46,200
Clarke	31,800
Warren	22,400
Page	28,000
Shenandoah	61,800
Rockingham	105,900
Albemarle	38,500
Greene	4,500
Madison	17,400
Rappahannock	21,900
Total	$378,400

EIGHTH DISTRICT.

Loudoun	$107,500
Fauquier	91,000
Culpeper	45,000
Orange	31,300
Louisa	23,800
King George	11,200

Stafford	17,000
Prince William	35,900
Fairfax	51,200
Alexandria	6,900
Total	$420,800

NINTH DISTRICT.

Bland	$ 4,300
Washington	34,300
Wise	700
Wythe	35,300
Buchanan	520
Craig	2,700
Dickenson	350
Giles	5,000
Lee	2,900
Pulaski	15,300
Russell	8,500
Scott	7,200
Smyth	19,100
Tazewell	10,500
Total	$146,600

TENTH DISTRICT.

Augusta	$138,000
Highland	6,300
Bath	3,600
Rockbridge	41,600
Alleghany	2,900
Botetourt	23,000
Amherst	22,300
Appomattox	34,700
Cumberland	32,500
Buckingham	36,000
Fluvanna	17,200
Nelson	15,200
Total	$373,300

FRUIT EXHIBIT BEDFORD COUNTY HORTICULTURAL SOCIETY.

apple, and that one variety of corn is as good as another, and that any tree should give good crops of good apples, and at the same time the orchard should furnish them a hayfield and a pasture. They consult the almanac to see when the moon changes, as certain things must be done "in the light or the dark of the moon." They run big plows through their corn or cotton to hill it up, and tear the roots in doing it, simply because they have always done this, and have never read of a better way. They say that their land is too poor for this or that crop, and never seem once to realize that there is any responsibility resting on them for its being poor. In fact, in all successful or unsuccessful farming there is more in the man than in the land.—*Exchange.*

RAW MATERIALS AND MIXED FERTILIZERS.

It is the custom with a considerable number of farmers in all sections of the country where fertilizers are used to buy raw materials, like acid phosphate, cotton seed meal and kainit, and mix their own fertilizers instead of purchasing the mixed fertilizers of the factories. The disadvantage of this practice is the greater difficulty in mixing the materials as thoroughly as is done by machinery, and the greater cost in doing it by hand labor, unless the mixing be performed on rainy days or at other times when labor is not otherwise profitably employed. The advantages are that the observing farmer, who studies his soil, can come nearer adjusting the proportions of the different constituents to the needs of his crops and soil than can the fertilizer manufacturer. He can take into consideration the previous cropping of the soil, or future treatment to which he may wish to subject it, and make mixtures that will better enable him to carry out successfully a certain line of farm operations.

If, for instance, a crop of peas has been grown on a field and removed for hay, the quantity of nitrogen, or ammonia, furnishing material may be reduced by at least one-half, with the expectation of getting as good results as if the full amount of this constituent in an ordinary complete fertilizer were present. On the other hand, if the entire pea crop is turned under in the winter, it is generally found to be a waste of nitrogen to apply any at all in the fertilizer for ordinary crops. These and other similar advantages come to the thoughtful farmer when he buys the raw materials and mixes his own fertilizers to fit into his system of farming. It is also generally found that the raw materials can be purchased $2 to $5 less per ton than a mixed fertilizer containing the same quantities of nitrogen, ammonia, phosphoric acid and potash.

COMPARATIVE COST OF RAW MATERIALS, 1901 AND 1902.

Granting, however, that the farmer can get just what he wants to suit his crops and land in a mixed fertilizer, the question as to whether or not he can mix the materials for less than the difference in cost of the raw and mixed fertilizers must be settled. An examination of the wholesale and retail market prices of fertilizers and fertilizer materials as existing at present shows that there is very little difference in values this season and the same time last year as is shown by the following comparisons. In small quantities of slightly more or less than five tons, for cash, at the factory or port: Acid phosphate,

THE ORCHARD.

THE IMPORTANCE OF THE FRUIT INDUSTRY IN THE STATE.

No State in America offers better advantages to the fruit grower than Virginia. The soil, the climate and the location, all of these existing together in one State, gives to the fruit grower more advantages than can be found elsewhere. The profits from orchards well cared for are not exceeded in any other State. An investment in an apple orchard that is planted with the best varieties, and properly cared for, is almost a perpetual investment in this State. There are apple trees in Nelson, Roanoke, Patrick and other counties one hundred years' old, and still bearing fruit, some of them producing over 100 bushels per tree in one crop. Orchards have produced a revenue from $300 to $500 per acre. An orchard in Rappahannock county yielded an income of $750 per acre from one crop. An orchard in Shenandoah county yielded, from 500 Ben Davis trees, four years old, 80 barrels of marketable apples, and in the eighth year yielded 2,000 bushels. There are many farmers, who, ten years ago, were hard pressed to make buckle and tongue meet at the end of the year, are now out of debt, and buying more land, and living in ease and comfort. The money was made from their well-cared-for orchards. These orchards will be a valuable heritage for their children. Fifty years from now these orchards will continue to bear if properly managed, while not a tree *standing now*, in the West, will, at that age, even leave a stump to mark its former place. The trees live longer here, and produce a better quality of fruit than grown elsewhere. There is no better investment than in a well selected and properly treated apple orchard. Peaches, pears and other fruits are profitable when given good attention. There are now several very large orchards in this State. The Diamond Orchard Company, in Roanoke county, and the Scott orchards in Floyd county are the largest. These two orchards consist of more than 100,000 fruit trees, they are well cared for, and will produce an immense revenue in a few years. Virginia has growing 8,190,000 apple trees, 1,939,000 peach trees, 269,000 cherry trees, 291,000 pear trees, 118,193 plum trees and 831,000 grape vines. These should be only a beginning in the fruit business in Virginia.

ANOTHER ORCHARD SYSTEM OF FERTILIZATION.

A bulletin from the Cornell Station, New York, has some sensible remarks about the cultivation of the orchard through the application of barnyard manures, special fertilizers and the growing of clover crops. The purpose of the bulletin is to record some experiments, and draw deductions therefrom,

which will help the modern scientific orchardist who believes in getting the best possible results from his fruit trees. The need of some system of fertilizing the orchard lands to make the trees produce large, handsome commer-

PROTECT THE BIRDS, THEY ARE THE FRUIT-GROWERS AND FARMERS BEST FRIENDS. THEY DESTROY ANNUALLY MYRIADS OF INSECTS.

cial fruits is universally felt. Most of the progressive growers have reached the conclusion that green manure is more economical and as satisfactory

Courtesy of Hon. G. B. Ellis, Mo.

SHOWING WHAT AN ORCHARD WILL MAKE WHEN NEGLECTED.

as expensive fertilizers and barnyard manures. The different clover and grass crops raised in an orchard should be for the double purpose of protecting the tree roots in winter, and for fertilizing the soil by turning under early in spring. In the experiments made at the above station it was found that of the various crops sown in mid-summer, after the sod of the winter crop had been plowed under and allowed to decompose, the alfalfa gave to the soil by the following spring 136 pounds of nitrogen to the acre, mammoth red clover 130 pounds, crimson clover 104 pounds, and common red clover 87 pounds. Similarly the hairy vetch and soy bean were planted, and on one acre the former from the heaviest yield produced 256 pounds of nitrogen, and the cow pea 52 pounds, both within three months after planting. According to these returns it was estimated that the hairy vetch added to the orchard soil in the form of nitrogen, phosphoric acid and potash about $58 worth of material to each acre. Added to this fertilizing value of the green crops, there is the advantage obtained of protecting the trees in winter. Another point to which attention is called is the good obtained in the use of these plants by preserving the moisture in the soil in hot weather, and in inducing the roots of the trees to penetrate far down into the sub-soil. Such deep-rooted trees are always the sturdiest and best producers.

New York. PROF. S. N. DOTY.

THINNING THE PEACH.

One of the practices most essential to successful fruit-growing is the proper thinning of the fruit. The percentage of fruit growers who thin their fruit is small. The percentage of fruit-growers who are successful is also small. Nearly every successful fruit-grower thins his fruit. The importance that some of these men attach to thinning may be seen from the following replies to the question, "Will it Pay to Thin Fruit?"

"Yes."—S. D. Willard, New York.

"Yes, enormously."—Roland Morrill, Michigan.

"Yes; could not succeed without it."—J. H. Hale, Georgia.

"Yes, decidedly. We would no more think of raising a crop of fruit without thinning than without cultivating."—H. W. Miller, West Virginia.

"Decidedly; without thinning I doubt if I could pay expenses."—J. C. Shinn, California.

"Yes, emphatically, although I have paid as high as 50 cents per tree to have them thinned."—Fred. M. Buck, California.

The principal object in thinning is to give fruit its three greatest qualities—size, flavor and color. Nature's great desire is to have a tree reach maturity and produce its kind. Her aim is, therefore, to have a tree produce as much fruit as possible, regardless of quality. Man's greatest desire is to have a tree produce fruit of a superior size, flavor and color. He, therefore, strives for quality in preference to quantity. This increase in size, flavor and color often determines the success of the fruit-grower. When the market is glutted, second-class fruit can hardly be sold at all, while first-class fruit will always bring a good price.

Of all the methods employed by both nature and man, thinning the fruit

by hand can be made by far the most thorough and successful. In hand thinning, man can wait until all danger of frost is over. He can wait until nature has aided him with her many methods. He can then thin to suit the season and his own special tastes.

In thinning the fruit, it is generally best to take hold of the limb with the left hand and pull off the fruit with the right. When a person is able to stand on the ground (which should be done when possible), he can often use both hands in pulling off the fruit. No deformed or inferior fruit should be left on the tree. A person soon becomes able, almost at a single glance, to tell what fruit should come off the tree.

Considerable attention should be given to the limb on which the fruit grows. A short, stocky limb will generally be able to support its fruit much closer than a long, slender branch. The severest thinning should take place at the base and inner parts of a tree. All things being equal, the fruit should be left that is the most exposed to the sunlight.

There is no definite time to thin. It is one of those questions that must be determined largely by circumstances. It is generally believed, however, that the thinning should not be earlier than the "June drop" nor later than the hardening of the pit. Some growers are governed only by the size of the fruit, thinning when the fruit reaches the size of a small marble, hazel or hickory nut.

In deciding upon the best time to thin, it should be remembered that the greatest desire in thinning is to secure the largest-sized fruit possible. In order to procure this extra size, it is very essential that the young fruit be abundantly supplied with food as soon as possible after the fruit has set. Every day the surplus fruit remains on the tree, food and energy are being wasted. A number of methods were tried at Ithaca, N. Y., to determine the best time to thin. The trees were in blossom May 8th. The first thinning was made June 12th, after which thinnings were made every week until July 18th. The first two thinnings, which were made before the June drop, gave by far the best results.

It is held by most fruit-growers that the fruit should not be thinned until after the general drop, so as to avoid danger of a late frost and the labor saved by the drop. As a matter of fact, practically all danger of a killing frost is over some two weeks after the blossoms fall. As for the labor saved, while a limb is being thinned it takes very little more time to pull off a few more fruits. Then, too, the thinning need not be so severe as when the drop has taken place, as an allowance should be made for the fruit that will fall during the drop. By thinning some two weeks after the blossoms fall, nearly a month's time can be saved over the late method. I believe the food and energy saved in that time is of more importance than the labor and possible danger avoided by the late process.

Fig. 1 shows the natural size of the fruit at the second thinning. For the best results in thinning, I believe the process should take place before the fruit reaches this size.

The proper distance to thin is another question for which no definite rule can be given. Nearly every fruit-grower has his own methods, which vary from time to time. Some men thin for a certain distance, while others are

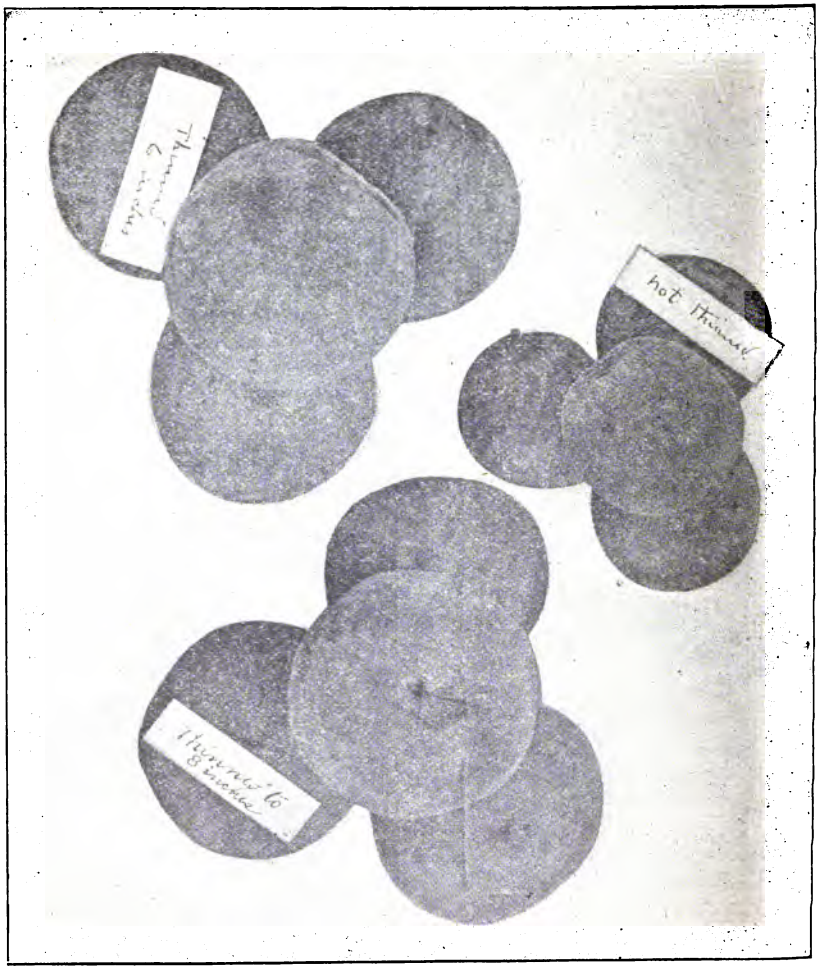
guided only by the quantity of fruit on the tree. When the fruit is desired for drying, four or five inches is generally sufficient; when general market fruit is wanted, six to eight inches will probably do, while fruit for special market or show purposes should not be left closer than ten inches.

Experiments were made with the Hill's Chili peach to determine the value of four different distances—three, four, six and eight inches. The results showed that there was little gained by thinning to only three inches, while the four-inch method was not much better. The trees that were thinned from six to eight inches gave by far the best results. There seemed to be,

however, very little difference between these last two methods (see fig. 2). After the fruit has been thinned to six inches it is only a matter of personal taste how much more should be sacrificed.

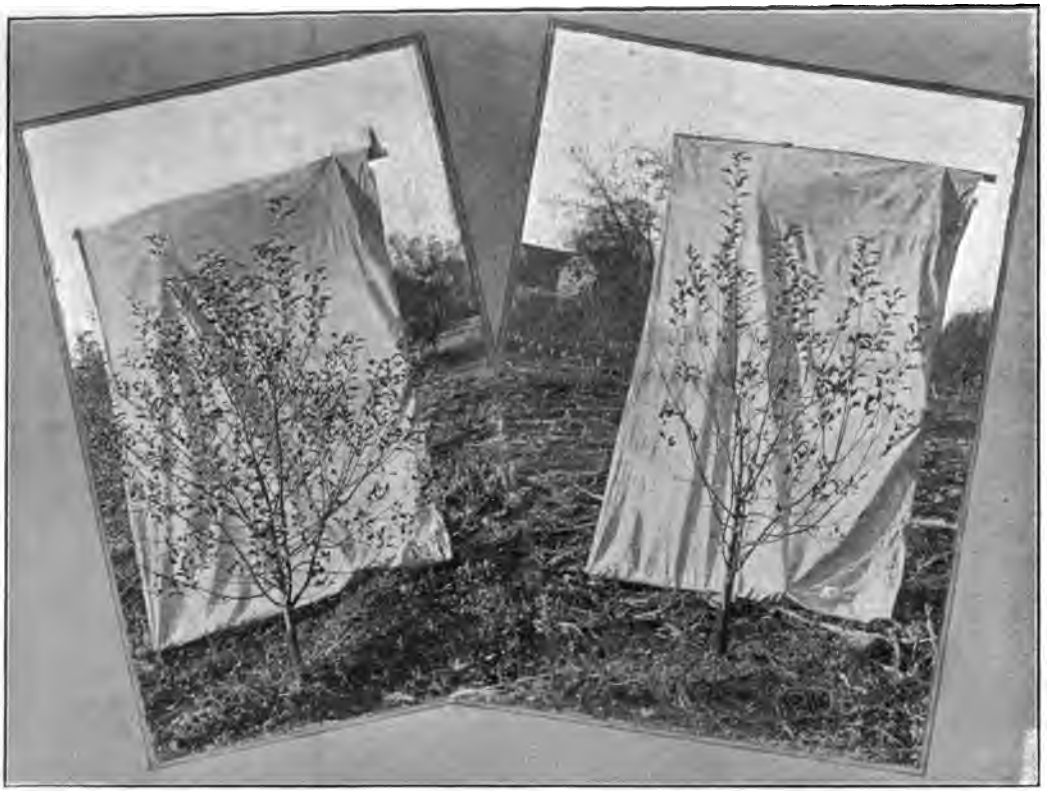
In determining the distance for their fruit, several things must be taken into consideration. It sometimes happens that trees set their fruits "spotty" or in clusters. When this happens, special methods should be applied. It is sometimes necessary only to thin the fruits so they will not touch, but generally the safest plan is to thin to at least two-thirds the distance taken

when the tree sets its fruit uniformly. Attention must also be given to the individuality of a tree, the variety and the season. Although trees are of the same variety and within a few feet of each other, they often vary considerably in their ability to produce fruit. The large and heavy-bearing varieties usually give the best results from thinning. A tree can support more fruit during a wet than a dry season.



THINNING THE PEACH.

There is little doubt that thinning tends to make a tree bear more uniformly year after year. We often hear of "poor" and "bad" fruit years. It is probable that these erratic years would be decreased if the trees were thinned year after year. Prof. C. P. Close has the following to say on this subject:



Courtesy of Hon. G. B. Ellis, Mo.

EFFECT OF GROWING CROPS TOO NEAR THE TREES.
The tree on right was too much crowded. Tree on the left had more air space. Note difference in one season's growth.

"In studying the results of different methods upon individual trees, the most marked and universal was this: The trees thinned early, severely, in 1897, did not set so much fruit in 1898 and 1899 as did trees thinned by other methods, but it was much better distributed, and all that or even more than the trees could mature. This favorable effect of early, severe thinning was constant throughout the experiment, and in most instances the fruit from trees so thinned was larger than from trees thinned by other methods. What more could be wished for?"

"The cost of thinning," says J. H. Hale, "depends largely on the tree, the season and the fellow who does the job." It probably depends as much upon the part of the country in which the work is done. The cost of thinning a healthy ten-year-old Hill's Chili peach tree was estimated by a number of successful growers, from different sections of the country, all the way from 2 to 25 cents. The first figure is undoubtedly too low; the second is a little too high. An average laborer should be able to thin ten medium-sized peach trees per day. If the laborer is paid $1.20 for his work, the average of each tree would be 12 cents. From my own experience and observation, I believe this is a close estimate. For good, careful work, the thinners should always be paid by the day, and never by the tree.

Thinning the peach can no longer be looked on as a special practice. It is as essential to successful fruit-growing as pruning or cultivating. A man should thin his peaches whether he has one tree or a thousand. The following reasons might be given for thinning:

1. It gives the fruit a better size, flavor and color.
2. It tends to make a tree bear more regularly year after year.
3. It lengthens the life of a tree.
4. It lessens disease.
5. It pays, and few can succeed without it.

ED. J. KYLE.—*Country Gentleman.*

HOW A SUCCESSFUL PEACH GROWER PRUNES HIS TREES.

Mr. Morrill: "In this climate, or the climate south of here, I am impressed with the idea that I would prune any time in the winter, but I want to tell you one thing: the pruning of the peach hastens the development of the blossom, and every spring a little quicker than on an unpruned tree, and that puts us up against a difficult proposition in the South. With us, we wait until after the 10th of March, that date being within a few days of the date on which we get our last severe blizzard. Probably within twenty years our most severe blizzard has come within five days on either side of the 10th of March; we get a bad blow-out. After that we go right out, get all the help we can, and get it done before the buds start, if possible. I presume that would apply in Southern Illinois as well. There is this difficulty in pruning. We cut back severely, and we wait till the winter killing-season is over, because it sometimes occurs that the bud is killed largely on the tree, and if you ever noticed, they kill from the base, your live buds will be at the tips, or nearer the tips, at the same time the tip buds are those most liable to be cut off; therefore, as a natural condition, the base buds are at

the base of the twig, so when we cut back, and there comes a severe weather, we lose a crop, so we wait until it is over. In 1899 I had an elegant crop of peaches on forty acres, while there was no other crop this side of the Rocky Mountains. I had 12,000 bushels, and they were largely on the tips. Those trees had never been exhausted in any way by over-vitalizing, or underfeeding."

President Dunlap: "That fact, that they were on the tips, and you pruned late, was what saved you, was it not?"

Mr. Morrill: "When we went out to prune, from careful observation we learned where our crop was, and we did not leave much to the pruning knife."

COMMON SOAP AS AN INSECTICIDE.

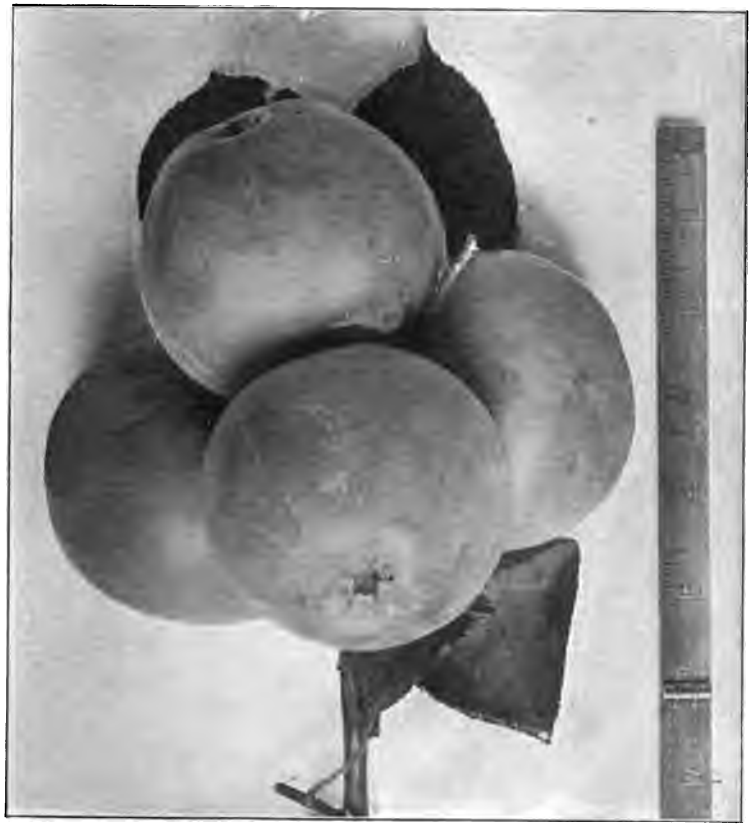
It has long been known that soap-suds are useful in destroying plant lice, and the housewife, as well as the gardener and florist, has used them on plants with success. Our experience with soap as an insecticide began in the greenhouse by using "Ivory" soap, one-fourth pound dissolved in one gallon of water, and applied to chrysanthemums to kill black lice, to *Ageratum* to destroy *Aleyrodes* or white fly, to carnations to kill red spider, and to cinerarias, *Hibiscus* and cigar plant (*Cuphea*) to kill green lice. Whether the plants were dipped or whether the suds were applied as a spray, they destroyed the insects, but some of the plants were injured.

The mixture was then diluted one-half, and on January 12th all the carnation plants were sprayed to kill red spider, with satisfactory results. Wherever the spray came in contact with it, red spider was killed. But it is well nigh impossible to thoroughly cover thick-growing plants, so some lived to perpetuate the pest in the house. Later the plants were given a careful spraying once each week, and red spider was kept in check nicely even where it had thoroughly infested the plants. Lice and *Aleyrodes* were readily killed by the mixture, which is not only easily prepared, but lacks the disagreeable odor peculiar to many insecticides, especially whale-oil soap and tobacco water.

As the soap does not dissolve readily in cold water, the best method is to cut the soap in thin slices and dissolve in boiling water, then add enough cold water to make the right proportions. The mixture thickens to a jelly-like substance on cooling and must therefore be applied warm. It may be sprayed upon the plants, or small potted plants may be dipped into a pailful of the mixture.

Bars of fresh "Ivory" soap were found to have an average weight, exclusive of the wrapper, of 258 grams, or about 9 ounces, while the small size weighed 152 grams, or 5.3 ounces. Thus in common practice, the soap need not be weighed nor the water measured, but half of a cake of laundry size or four-fifths of a small-sized cake will answer for a pailful. The common-sized pail holds two and one-half gallons when filled to the brim, but it cannot be conveniently carried if charged with more than two gallons.

"Welcome" soap was next given a trial and found to be fully as effective as "Ivory" when dissolved in the same proportions, and to dissolve somewhat more readily. It does not thicken as quickly on cooling. The bar of laundry-



Courtesy Rural, N. Y.

YELLOW TRANSPARENT APPLES.

Grown in York county. A good Summer Apple for Tidewater.

size weighs 317 grams, or about 11 ounces. One of these cakes may, therefore, be divided into three pices and each dissolved in a pail of water.

The tomato house has each winter for several years been infested with white fly (*Aleyrodes vaporariorum* West.), and many remedies have been used, none of which have proved more effective than soap and water. Fir-tree oil was equally so, but is too expensive for general use. The tomato plants were sprayed about, every week for three months with "Welcome" soap dissolved in water at the rate of one pound in 8 gallons. The spray seemed to kill all larvæ and adults with which it came in contact. During the operation many adults fly from the plants, but are hit by the spray when in mid-air and killed.

Continued applications of soap and water to the tomato plants for three months, without washing off the soap, finally coated the leaves to an injurious extent, and the practice was abandoned. Other kinds of plants which were frequently sprayed with water from the hose were uninjured, and it is apparent that the long-continued use of the soap without washing it off is the reason for the injury. We still use this remedy for the same purpose, but either do not apply it so frequently or else the plants are sprayed occasionally with clear water.

Since then soap and water has been used here to kill *Aphis* on apple, plum and cherry trees, and a great variety of plants, *Lecanium* on ferns, red spider, thrips, and newly-hatched scale insects, especially oyster-shell and scurfy bark-louse, and San Jose scale. It is not effective in killing the mature individuals which are covered by the shell or armor, but it readily kills the newly-hatched individuals.

Doubtless any laundry soap would answer the purpose quite as well as the kinds used, and for effectiveness, cheapness, convenience and cleanliness in preparing and using, soap and water should take a high rank among contact insecticides, especially for use in dwellings, greenhouses and gardens.—*Conn. Report.*

TWIG BLIGHT.

Two correspondents, one of Granger, Iowa, and the other of Kanawha, Iowa, write us with reference to a disease which one of them describes as follows:

"What is the matter with my apple trees? The limbs start to die at the tips and die back as far as this year's growth? They are perfectly sound as far as I can see, and have never been bothered with borers. Is there any remedy for it?"

The other writes:

"I have several apple trees which seem to be dying and I send you samples. Please tell me what is the matter with them?"

The twig sent contained bacillus amalovorous or micrococcus amyovorus as it is called. This disease is known as fire blight, twig blight, body blight and other names given to it from the peculiar manner in which the part of the tree affected dies. Prof. T. J. Burrill was the first to discover the micro-organism, something like twenty years ago. He, with Prof. Arthur and others,

have carried on experiments in raising the bacillus in pure cultures and inoculating trees with it, and the results were that the disease followed the inoculation. No remedy is yet known that will prevent or cure the disease. All that can be done to prevent it is by sanitary treatment, keeping the orchard as free as possible from infection by cutting out and burning all diseased wood whenever noticed. The disease is carried over from year to year in the orchard by diseased wood remaining in it. If a remedy was known, it would be difficult to apply it to the source of infection. Just how the germs are distributed over the orchard is not fully known. It is attributed to insects, the wind and other agencies. They find lodgment in the new growth of the twigs, or blossoms of the fruit spurs on the older wood. Whether they enter through the stomata, or in punctures made by insects, has not been demonstrated, but possibly by both. When the micro-organism finds lodgment within the twig, it lives in the sap, multiplies rapidly, produces fermentation, and the twig dies for want of nourishment.

Any condition which produces a succulent growth in the trees seems favorable for the blight. The warm, wet weather has caused quite an outbreak of the disease. The germ finds lodgment in the tree several weeks before it is noticed, just how long has not been definitely determined, possibly the length of time will vary with the temperature. The disease is more destructive to the pear than the apple. It also attacks other trees of the Rose family. Whether it is the same species or others closely allied to it is still open for further investigation. WESLEY GREENE.

HOW TO MAKE BORDEAUX MIXTURE.

All things considered, it is believed that the best results will be obtained from the use of what is known as the 50 gallon formula of this preparation. This contains—

Water	50 gallons.
Copper sulphate (blue stone)	6 pounds.
Unslaked lime	4 pounds.

It has been found that the method of combining the ingredients has an important bearing on both the chemical composition and physical structure of the mixture. For example, if the copper sulphate is dissolved in a small quantity of water and the lime milk diluted to a limited extent only, there results, when these materials are brought together, a thick mixture, having strikingly different characters from one made by pouring together weak solutions of lime and copper sulphate. It is true, furthermore, that if the copper sulphate solution and lime milk are poured together while the latter or both are warm, different effects are obtained than if both solutions are cool at the moment of mixing. Where the mixture has been properly made there is scarcely any settling after an hour, while the improperly made mixture has settled more than half in an hour.

Briefly, the best results have been obtained from the use of the bordeaux mixture made in accordance with the following directions: In a barrel or other suitable vessel place twenty-five gallons of water. Weigh out six pounds of copper sulphate, then tie the same in a piece of coarse gunny sack

and suspend it just beneath the surface of the water. By tying the bag to a stick laid across the top of the barrel no further attention will be required. In another vessel slake four pounds of lime, using care in order to obtain a smooth paste, free from grit and small lumps. To accomplish this it is best to place the lime in an ordinary water pail and add only a small quantity of water at first, say a quart or a quart and a half. When the lime begins

MAKING BORDEAUX MIXTURE. *U. S. Dep. Agri.*

to crack and crumble and the water to disappear add another quart or more, exercising care that the lime at no time gets too dry. Toward the last considerable water will be required, but if added carefully and slowly a perfectly smooth paste will be obtained, provided, of course, the lime is of good quality. When the lime is slaked add sufficient water to the paste to bring the whole up to twenty-five gallons. When the copper sulphate is entirely dissolved and the lime is cool, pour the lime milk and copper sulphate solution slowly together into a barrel holding fifty gallons. The milk of lime should be thoroughly stirred before pouring. The method described insures good mixing, but to complete this work the barrel of liquid should receive a final stirring, for at least three minutes, with a broad wooden paddle.

TESTING BORDEAUX MIXTURE TO SEE IF IT CONTAINS SUFFICIENT LIME.

It is now necessary to determine whether the mixture is perfect—that is, if it will be safe to apply it to tender foliage. To accomplish this, two simple tests may be used. First insert the blade of a penknife in the mixture, allowing it to remain there for at least one minute. If metallic copper forms on the blade, or, in other words, if the polished surface of the steel assumes the color of copper plate, the mixture is unsafe and more lime must be added. If, on the other hand, the blade of the knife remains unchanged, it is safe to conclude that the mixture is as perfect as it can be made. As an additional test, however, some of the mixture may be poured into an old plate or saucer, and while held between the eyes and the light the breath should be gently blown upon the liquid for at least half a minute. If the mixture is properly made, a thin pellicle, looking like oil on water, will begin to form on the surface of the liquid. If no pellicle forms, more milk of lime should be added.

The foregoing directions apply to cases where small quantities of the mixture are needed for more or less immediate use. If spraying is to be done upon a large scale, it will be found much more convenient and economical in every way to prepare what are known as stock solutions of both the copper and lime. To prepare a stock solution of copper sulphate, procure a barrel holding fifty gallons. Weigh out 100 pounds of copper sulphate, and after tying it in a sack suspend it so that it will hang as near the top of the barrel as possible. Fill the barrel with water, and in two or three days the copper will be dissolved. Now remove the sack and add enough water to bring the solution again up to the fifty-gallon mark, previously made on the barrel. It will be understood, of course, that this second adding of water is merely to replace the space previously occupied by the sack and the crystals of copper sulphate. Each gallon of the solution thus made will contain two pounds of copper sulphate, and, under all ordinary conditions of temperature, there will be no material recrystallization, so that the stock preparation may be kept indefinitely.

Stock lime may be prepared in much the same way as the copper sulphate solution. Procure a barrel holding fifty gallons, making a mark to indicate the fifty-gallon point. Weigh out 100 pounds of fresh lime, place it in the barrel, and slake it. When slaked, add sufficient water to bring the whole mass up to fifty gallons. Each gallon of this preparation contains, after thorough stirring, two pounds of lime.

When it is desired to make bordeaux mixture of the fifty-gallon formula it is only necessary to measure out three gallons of the stock copper solution, and, after thorough stirring, two gallons of the stock lime; dilute each to twenty-five gallons, mix, stir, and test as already described. One test will be sufficient in this case. In other words, it will not be necessary to test each lot of bordeaux mixture made from the stock preparations, provided the first lot is perfect and no change is made in the quantities of the materials used. Special care should be taken to see that the lime milk is stirred thoroughly each time before applying. As a final precaution it will be well to keep both the stock copper sulphate and the stock lime tightly covered.—*United States Dept. of Agri., Bul.* 38.

By mixing one-fourth of a pound of paris green with the bordeaux mix-

ture the solution can be used as an insecticide as well as a fungicide. One spraying will answer for both purposes. The paris green should be put in a dish or vessel and mixed with enough water to make a consistency of custard and then mixed with the bordeaux, this will secure a better mixture; use one-fourth of a pound of the paris green to fifty gallons of water; spray for the codling moth when the petals or flowers of the apple blossoms fall, and repeat ten days or two weks thereafter; make about three sprayings.

CAUSTIC SODA FOR BORDEAUX MIXTURE.

The Ohio Experiment Station has recommended the use of Soda Bordeaux mixture in the treatment of vineyards for grape rot and the spraying of apple trees for the bitter rot of apple. There is trouble at times in getting caustic soda of the proper strength, but the formula for a standard brand is as follows:

Copper Sulfate (blue vitriol).....4 lbs.
Caustic Soda (sod. hyd.) .....1 lb. 3 oz.
Water, to make .....50 gallons.

The solutions of copper sulfate and caustic soda should be put into the barrel or tank only after nearly filling it with water, and afterwards thoroughly agitating by pumping the mixture back into the tank through the hose with the nozzle removed. The mixing of spray preparations of this sort outside the spray tank is unnecessary—the process may be best conducted by putting the ingredients directly into the tank—but not until water enough has been added to make them quite dilute.

HOW TO KEEP QUICK LIME FROM AIR SLAKING.

The method is very simple—merely water-slake it and keep it covered with water. In this condition it will keep indefinitely, but we need to know just how much water-slaked lime a certain amount of quick lime makes. A convenient way is to slake say eighty pounds of lime. Then pour exactly forty gallons of water into a barrel and make a permanent mark to indicate forty gallon measure. Pour the water out. Strain the water slaked lime into the barrel and add water to bring to forty gallon mark. Such a barrel may be placed in a protected corner and covered to keep trash out and the water slaked lime be kept for a long time—several years. The lime will settle to the bottom in a day or so, and clear water will be above, and so long as the slaked lime is kept under water no change in its chemical composition will take place. When the lime is to be used enough water is added to bring it up to the forty-gallon mark, the material stirred thoroughly to make it of even composition and then every half gallon taken out will contain one pound of lime.

HOW TO KEEP OFF BORERS.

I send one of the best applications for apple and peach trees to prevent borers: Mix 12 ounces of crude carbolic acid, one quart of soft soap, with

three gallons of water, and wash the trees from the forks to the ground, on about the first of June and September, cleaning the rough bark off first. The bark will be yellow and the tree vigorous. I know from experience.—W. L. Faulk, Moberly, Mo.

Also look for the borer with a wire and knife—don't depend on any nostrum.—*Commissioner.*

HOW TO DESTROY THE ELM TREE BEETLE ON OUR SHADE TREES.

"The larvae of the elm tree beetle can be destroyed by spraying with paris green in water, using one fourth pound of the green to fifty gallons of water, and apply with a spraying pump and nozzle to all parts of the foliage. Or use kerosene emulsion in the same way. The emulsion is made by dissolving one half pound of common lye soap in a gallon of warm water. Then add two gallons of kerosene and churn it until the oil and soapsuds unite in a creamy emulsion. Add then twenty five gallons of water and spray. The paris green will be more quickly effective, but is a virulent poison and more dangerous to handle and will poison the grass underneath the trees, so that anything eating it will be poisoned. A second spraying may be necessary if any live worms are found a week after the first."

THREE NEW FARMERS' BULLETINS.

FARMERS' BULLETIN NO. 154.

The United States Department of Agriculture has recently issued Farmers' Bulletin No. 154, entitled "The Home Fruit Garden: Preparation and Care." This bulletin was prepared by L. C. Corbett, Horticulturist of the Bureau of Plant Industry of the Department, and contains much information in regard to the laying out and care of small fruit gardens.

After stating the object of a fruit garden, the bulletin describes the relation of the home garden to the fruit interests, the influence of amateur fruit growers upon communities, changed conditions of fruit culture, and the advantages and pleasures of the home fruit garden. This is followed by directions for cultivation of the garden, including modification of the soil, preparation of plants, pruning and protection. Suggestions are given for adapting plants to the conditions prevailing, combining plants of various habits and growth, and for a combined fruit and vegetable garden.

A list of varieties of fruits for home gardens of different areas is also given.

FARMERS' BULLETIN NO. 156.

Another bulletin in the same line is Farmers' Bulletin No. 156, entitled "The Home Vineyard, With Special Reference to Northern Conditions." This paper was written by W. H. Ragan, Special Agent of the Bureau of Plant Industry, engaged upon pomological investigations, and was prepared for the guidance of persons who wish to grow grapes in a small way rather than for the extensive vineyardist. The author says the grape should be more frequently found growing on the farmer's premises. It is easy of culture and

brings almost certain reward for the care and attention bestowed upon it. It is a mistaken notion that its culture requires special skill and knowledge beyond his abilities. The writer hopes that this bulletin may help to remove this erroneous impression from the minds of farmers and thus render the grape more popular with them.

FARMERS' BULLETIN NO. 157.

A third new publication is Farmers' Bulletin No. 157, entitled "The Propagation of Plants." In this bulletin Professor L. C. Corbett, Horticulturist of the Bureau of Plant Industry, treats the subject in a brief, simple, and practical manner with the purpose of assisting and encouraging farmers in the propagation of plants for their own use, especially small fruits, grapes, and orchard fruits.

A knowledge of how plants may be produced by natural or artificial means is of great importance to agriculturists of all classes, and especially to those engaged in the various branches of horticulture. There are, for instance, so many benefits to be gained by the local production of nursery stock that fruit growers of a developing region can not afford to neglect this art. The introduction of dangerous pests can be avoided, scions and buds from trees thoroughly acclimated can be obtained, the young stock will not be forced to suffer the shock of long transportation and a change of climate, and last, and by no means least, the orchardist can have his trees grown from scions or buds from his favorite trees.

Directions are given in the bulletin for propagating plants by seed, by cuttings, by layering, by various methods of grafting, and by budding.

Copies of these bulletins will be sent to any address on application to Senators, Representatives, and Delegates in Congress, or to the Secretary of Agriculture, Washington, D. C.

HOW TO CONTROL THE SAN JOSE SCALE.

THE SAN JOSE SCALE A PERMANENT FACTOR IN FRUIT GROWING.

The San Jose scale is so widely disseminated and has become so firmly established in the principal deciduous fruit regions of this country that its extermination is now, in most cases, out of the question. In the main, therefore, the San Jose scale must be recognized as a permanent factor to be regularly dealt with as are other insect evils or the fungous diseases of plants.

Extermination is possible only where the scale is detected at the very outset on new or recently planted nursery stock or, at least, before any considerable chance of spread has been afforded. It is true that by the greatest care in the introduction of nursery stock the San Jose scale may be kept out of districts now free from it for years, perhaps, and one is warranted, therefore, in adopting every precaution to avoid introducing this scale and even to attempt extermination wherever the conditions are reasonably favorable. There is only one certain method of exterminating the scale, and that is in digging up and burning all infested trees. This is an heroic remedy and is advised only under the conditions of very recent introduction of nur-

sery stock—in other words, where the scale is discovered within a few months after the purchase of the infested trees. If the scale has passed an entire breeding season in an orchard, it will have spread much more widely than any inspection will indicate and, very likely, will have gained a footing on wild and ornamental plants, other than fruit trees, from which it will reintroduce itself into neighboring orchards or into new plantings, however thorough may have been the attempts to eradicate it.

THE SAN JOSE SCALE CAN BE CONTROLLED.

While, therefore, one is undoubtedly justified in asserting that the San Jose scale is to be a permanency, it by no means follows that the profitable growth of deciduous fruits is seriously menaced on this account. The experience in California, covering many years, has abundantly demonstrated that this scale insect can be controlled, and the more recent experience in the East points indubitably to the same conclusion. In other words, by proper repressive and remedial treatment, the value of which has been demonstrated by much practical experience, an orchard can be protected from serious injury and kept in a good paying condition so far as influenced by the San Jose scale.

In view of the above, it is certainly very unwise and wasteful to dig up and burn a large portion of an orchard because it is infested with this scale insect, especially since the replanted stock, even if clean when purchased, would, with little doubt, be in the same condition of infestation in a very short time.

One of the main objects of this circular, therefore, is to emphasize the importance and value of honest efforts to control this insect for the great majority of districts where it has established itself, rather than efforts at extermination, which will prove successful rarely at best, and will always be accompanied with great immediate loss. The other principal object is to designate briefly the means of controlling this scale insect which experience has shown to be of practical value.

THE DIFFERENT MEANS OF CONTROLLING THE SAN JOSE SCALE.

In California, where this scale first occurred, the one remedy for it is in spraying with the lime, salt, and sulphur wash. This wash is very effective, and its use is possible in all climates similar to those of the Pacific coast. In the East, the moister climate and the more frequent rainfalls at and subsequent to the time when treatments have to be made render this wash, as a rule, ineffective, and distinct methods of treatment have been found to be necessary. The methods of control for the East are, in the order of their importance, as follows: (1) The soap treatment; (2) treatment with pure kerosene; (3) treatment with crude petroleum; (4) treatment with mechanical mixtures of either of the last two oils with water. In the main, these are all winter treatments and are made at any time when the trees are in a dormant, leafless condition. The treatments enumerated are all for trees in the orchard. Nursery stock badly enough infested to require such treatment is best destroyed. For the general disinfection of nursery stock the hydrocyanic acid gas treatment is the standard and only satisfactory means.

Virginia Department of Agriculture 1902.

1

YOUNG SCALE.

2

FEMALE SCALE.

3

MALE SCALE.

SCALE ON TWIG.

6

NEW SCALE ON APPLE.

4

OLD SCALE.

5

MASS OF OLD SCALES.

(SAN JOSÉ SCALE.)

THE ILLUSTRATIONS ARE ENLARGED.

STUDY THIS PERNICIOUS SCALE, BUY A CHEAP MAGNIFYING GLASS AND EXAMINE YOUR FRUIT

The Soap Treatment.—Whale oil or fish-oil soap, preferably made with potash lye, is dissolved in water by boiling at the rate of two pounds of soap to the gallon of water. If applied hot and on a comparatively warm day in winter, it can be easily put on trees with an ordinary spray pump. On a very cold day, or with a cold solution, the mixture will clog the pump and difficulty will be experienced in getting it on the trees. Trees should be thoroughly coated with this soap wash. Pear and apple trees may be sprayed at any time during the winter. Peach and plum trees are best sprayed in the spring, shortly before the buds swell. If sprayed in midwinter or earlier, the soap solution seems to prevent the development of the fruit buds, and a loss of fruit for one year is apt to be experienced, the trees leafing out and growing, however, perhaps more vigorously on this account. The soap treatment is perfectly safe for all kinds of trees, and is very effective against the scale. With large trees, or badly infested trees, preliminary to treatment it is desirable with this as well as other applications to prune them back very rigorously. This results in an economy of spray and makes much more thorough and effective work possible. The soap can be secured in large quantities at from 3½ cents to 4 cents a pound, making the mixture cost, as applied to the trees, from 7 cents to 8 cents a gallon. The success of the soap treatment is largely influenced by the quality of the soap used. Many brands are on the market, mostly made with soda lye. A potash soap should be insisted on and one that does not contain more than 30 per cent. of water. The soda soap washes are apt to be gelatinous when cold and difficult or impossible to spray except when kept at a very high temperature.

Kerosene Treatment.—This consists in spraying the trees with ordinary illuminating oil (coal oil or kerosene). The application is made at any time during the winter, preferably in the latter part, and by means of a spray pump making a fine mist spray. The application should be attended with the greatest care, merely enough spray being put on the plant to moisten the trunk and branches without causing the oil to flow down the trunk and collect about the base. With the use of this substance it must be constantly borne in mind that careless or excessive application of the oil will be very apt to kill the treated plant. The application should be made on a bright, dry day, so that the oil will evaporate as quickly as possible. On a moist, cloudy day the evaporation is slow, and injury to the plant is more apt to result. If the kerosene treatment be adopted, therefore, it must be with a full appreciation of the fact that the death of the tree may follow. This oil has been used, however, a great many times and very extensively without any consequent injury of any kind. On the other hand, its careless use has frequently killed many valuable trees. Its advantages are its effectiveness, availability, and its cheapness, kerosene spreading very rapidly and much less of it being required to wet the tree than of a soap and water spray. Pure kerosene is more apt to be injurious to peach and plum than to pear and apple trees, and the treatment of the former as with the soap wash should be deferred until spring, just before the buds swell. With young trees especially it is well to mound up about the trunk a few inches of earth to catch the downflow of oil, removing the oil soaked earth immediately after treatment.

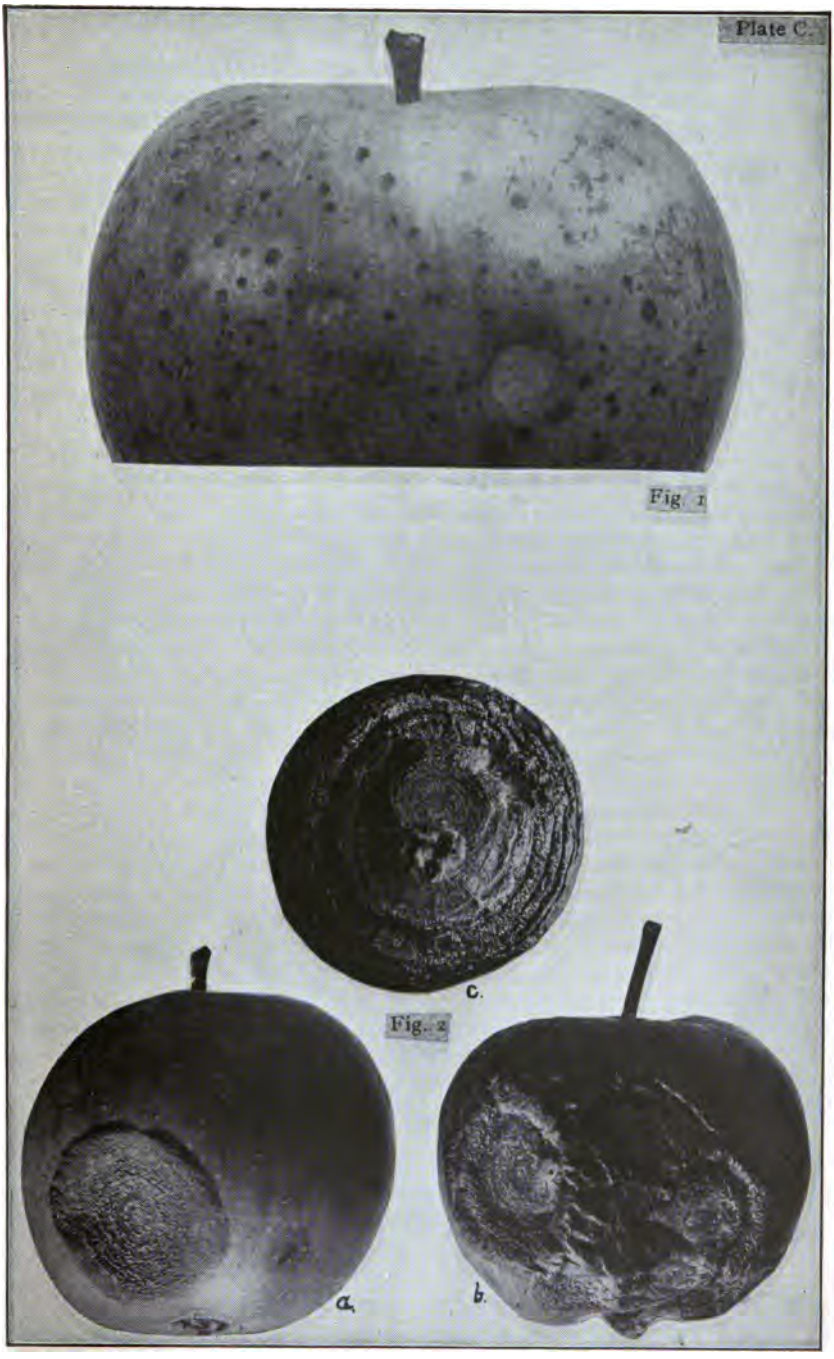
The Crude-Petroleum Treatment.—Crude petroleum is used in exactly the same way as is the common illuminating oil referred to above. Its advantage over kerosene is that, as it contains a very large percentage of the heavy oils and paraffin, it does not penetrate the bark so readily, and, on the other hand, only the light oils evaporate, leaving a coating of the heavy oils on the bark, which remains in evidence for months and prevents any young scale which may come from the chance individuals that were not reached by the spray from getting a foothold. Crude petroleum comes in a great many different forms, depending upon the locality, the grade successfully experimented with in the work of this Division showing 43° Baume. Crude oil showing a lower Baume than 43° is unsafe and more than 45° is unnecessarily high.—(Smith.) The lower specific gravity indicated (43°) is substantially that of the refined product, the removal of the lighter oils in refining practically offsetting the removal of the paraffin. The same cautions and warnings apply to the crude as to the refined oil.

The Oil-Water Treatment.—Various pump manufacturers have now placed on the market spraying machines which mechanically mix kerosene or crude petroleum with water in the act of spraying. The proportion of kerosene can be regulated so that any desirable percentage of oil can be thrown out with the water. A 10-per-cent-strength kerosene can be used for a summer spray on trees where the San Jose scale is multiplying rapidly and it is not desirable to let it go unchecked until the time for the winter treatment. The winter treatment with the water-kerosene sprays may be made at a strength of 20 per cent. of the oil. Applications of the oil-water spray should be attended with the same precautions as with the pure oil, and there is even somewhat greater risk, owing to the natural tendency one has to apply the dilute mixture much more freely than the pure oil. The application should be merely enough to wet the bark and should not, to any extent, at least, run down the trunk. The collection of water and oil about the trunk is just as dangerous to the tree as the pure oil.

In the use of the oil sprays noted above, one who has not had experience with them is advised to make some careful preliminary tests to fully master the process, preferably waiting two or three weeks to determine the results before entering on the general treatment of the orchard. It is well, also, with the oil-water mixtures, to test the pump from time to time, spraying into a glass jar or bottle to determine by actual measurement whether the percentage of oil and water is being properly maintained.

FUMIGATION OF NURSERY STOCK.

All nursery stock which is under the least suspicion of contamination with the San Jose scale should be fumigated; and it is perhaps worth while to fumigate in any case to give the utmost assurance of safety to the purchaser. The hydrocyanic-acid-gas fumigation is the one to use. This gas is generated by combining potassium cyanide, sulphuric acid, and water. The proportions of the chemicals are as follows: Refined potassium cyanide (98 per cent.), one ounce; commercial sulphuric acid, one ounce; water, three fluid ounces—to every 100 cubic feet of space in the fumigating room or house. The latter should be as near air-tight as possible and provided with means



DIFFERENT STAGES OF BITTER ROT.

of ventilation above and at the side, operated from without, so that at the end of the treatment the poisonous gases can be allowed to escape without the necessity of anyone entering the chamber. The generator of the gas may be any glazed earthenware vessel of one or two gallons capacity, and should be placed on the floor of the fumigating room and the water and acid necessary to generate the gas added to it. The cyanide should be added last, preferably in lumps the size of a walnut. Promptly after adding the cyanide the room should be vacated and the door made fast. The treatment should continue forty minutes. It must be borne in mind that the gas is extremely poisonous, and under no circumstances must be inhaled. The gas treatment is effective against the scale on growing trees in the orchard also; but the difficulty and expense of the treatment, except for nursery stock, makes it prohibitive in the case of deciduous fruits.

THE LIME, SULPHUR, AND SALT WASH.

This is the invariable remedy for the San Jose scale in California and much of the Pacific coast, and it is, under the conditions of climate obtaining in that region, undoubtedly very effective. Early experience with this wash in the East threw doubt on its efficiency as an insecticide under the climatic conditions prevailing throughout the eastern half of the United States. Some later experiments, however, have shown that wherever the weather conditions happen to be very favorable, duplicating, in a measure, the conditions on the Pacific coast, this wash is effective in the East also. Unfortunately, the weather conditions can not be relied on, and, therefore, its use in the East is not recommended. But if a considerable period (ten days or two weeks, at least) of dry weather could be assured after the treatment, it would probably give very satisfactory results when properly made and applied. It is a winter application and is applied in January or February, or at any time prior to spring growth. It may be prepared after the following formula: Unslaked lime, thirty pounds; sulphur, twenty pounds; salt, fifteen pounds. Place all together in a barrel with thirty or forty gallons of water and boil with steam for three or four hours. For use, the mixture should be diluted to make sixty gallons of wash, and may be preferably applied at a high temperature. It may be made in smaller quantities by boiling over a fire, using the same proportion of ingredients. This wash is applied nearly every year, or as often as the San Jose scale develops in any considerable numbers. It has the advantage of leaving a limy coating on the trees, which acts as a deterrent to the young scale lice, and where it is not washed by rains retains its value as an insecticide coating for some time, remaining in evidence on the trees for several months. — *U. S. Dep. of Agri. Circular No. 42.*

A VALUABLE ARTICLE ON THE TREATMENT OF BITTER ROT ON APPLES.

PREVENTION OF BITTER ROT.

This disease, which has sometimes proven so disastrous to the apple grower, has already been found this year widely distributed throughout the chief apple-growing regions of Illinois, and it has probably made the same

start elsewhere. It is never greatly developed at this season of the year, but sharp observers are able to find it when there are but few infected spots on the young apples.

A discovery just made, July 11th, founded upon the observation of an Illinois apple grower, seems to give an opportunity not before possible to combat the scourge, and this circular is issued hastily in the hope that a portion of the apple crop now liable to attack may be saved. It is a matter of common knowledge that the fruit first infected in a tree occupies a definite position in the branches. In general terms, it may be said that the disease shows in a conical shaped area with the apex upward, and this has been explained by the fact that the spores of the fungus are adhesive so that they cannot be distributed by wind but can readily be washed down by rain. The primary infection at the apex of this cone, commonly supposed to be an earlier diseased apple, furnished, it was thought, the spores which started the disease in the fruits underneath. It has now, however, been ascertained (and this is the new fact in the case) that this primary infection starts in a *canker* upon the limb of the tree. In this situation the fungus lives over winter and as early as sometime in June begins to produce spores by which the young apples are infected. It has been ascertained that this same thing takes place in a "mummied" fruit, and attention has heretofore been strongly directed to this. As, however, the mummied fruit commonly falls to the ground the matter remained a puzzle as to how the spores could rise to the tree. The new observations recently made by us in many orchards showed that the limb canker was in every case the source of primary infection, and therefore these cankers are much more dangerous than the old mummies. It is not usually easy to discover the cankered spot from the ground, but it is easy to locate it by the diseased spots on the apples. With a little practice, any one with eyes sharp enough to detect these latter can quickly find the former. It seems, therefore, entirely feasible to prevent further infection by a critical examination of the trees at this time of the year and the removal of the cankered limbs and the fruits already diseased from it.

WHAT THE CANKER LOOKS LIKE.

Canker occurs on limbs of any size—from those of an inch or two in diameter to last year's fruit spurs. More commonly the spot is two to four inches long. The affected portion is killed by the fungus and the new growth rises as a rim of healing tissue about its border. The spot is therefore sunken to the extent of the later increase in diameter of the limb. It is rough and black and has somewhat the appearance of an old, ragged wound as often results from many causes. By close observation it will be seen that the old bark of the killed portion is still present though usually variously ruptured and sunken. The fungus which causes the bitter rot of apples is present in this old bark and bears the spores in clustered masses over its surface, from which they are washed by the rain to the fruit as described. So far as observed, these cankered spots are few in number, except in the case of one variety, that of the Huntsman, where they are found to be very numerous. More often only a tree here and there in the orchard has a cankered limb.

A CANKERED LIMB AND APPLES AFFECTED FROM IT.

CANKERED LIMB AND APPLES AFFECTED FROM IT BY BITTER ROT.

DISEASED APPLES AND CANKERED LIMBS.

BITTER ROT CANKER.

PREVENTIVE MEASURES.

From what is now known, the following preventive procedure is advised: Examine the orchard tree by tree, following systematically the rows—perhaps on horseback or in some way to look down as much as possible upon the fruit, the infected spots being usually on the upper surfaces of the apples. At this time of the year these spots are brown, circular and very slightly depressed and show clearly against the light or reddish color of the apple. As soon as one spot is found search for others and just above the uppermost ones look for the cankered limb. This limb is sure to be in such a position that spores may be washed from it onto the spotted fruit. It will now be an easy matter to cut away the diseased limb and to remove the infected fruit below it. It will be safer, however, to take all the apples from that portion of the tree subjected to infection from the canker, for it may not be easy to find the very small spots where the fungus recently started. Cut well below the cankered spot, avoiding the rubbing of the infected area by tools or hands. The operator who goes into the tree top for the purpose of making examinations and removing cankered limbs should be provided with rubber boots or thin-soled shoes, so as to not in any way cause the rupture of the bark when climbing about. All diseased limbs and fruit removed from the trees should at once be put into a wagon or other receptacle and removed from the orchard where they will be either burned or buried deeply in the ground.

Experiments carried on this year by the University of Illinois prove conclusively that bitter rot can be very largely held in check by Bordeaux mixture, even when trees have one or more cankered limbs. It is believed, however, that a critical examination of the trees and the removal of the source of infection as described is the most important work the orchardist can do. This circular is therefore sent out with the hope that this later information with reference to bitter rot may be the means of saving the fruit growers of a wide section of the country from heavy losses. The University is now at work preparing additional information carefully illustrated which will be distributed in circular form within a week or ten days. Go to work now, however, with the information at hand, for the delay of a single day may mean the loss of your entire crop.

T. J. Burrill, Chief in Botany.
J. C. Blair, Chief in Horticulture.

Urbana, Ill., July 14, 1902.

THE PRESERVATION OF GRAPE JUICE AND SWEET CIDER.

The manufacture of unfermented grape juice and of sweet cider assumes considerable proportions in many localities, but difficulty is often experienced in preparing a product which will "keep," i. e., does not ferment.

Fermentation is due to the presence of micro organisms in the juice or cider, and may be prevented by sterilizing the latter as well as the vessels used in connection with the bottling of the product. Heating is the simplest, safest, and most effective means of sterilizing, but great care is necessary in order to so control the temperature as to secure thorough sterilization with-

out injuring the flavor of the product. A report of the Canada Experimental Farms gives an account of a series of experiments on the best means of sterilizing grape juice. The conclusion, which probably applies to sweet cider as well as to grape juice, was that "the natural flavor of grape juice may be preserved intact by raising the temperature of the juice gradually to 170° F., keeping it at this point for ten minutes and then quickly bottling it, taking care to use absolutely air-tight and thoroughly sterilized vessels. These vessels should be taken from a tank or kettle of boiling water, immediately filled, and corked or covered with the least possible delay."

The use of antiseptics, such as salicylic acid, is considered unwise. They are unnecessary, and unless used with great caution may be injurious to health.—*U. S. Experiment Bulletins.*

SHIPPING TRUCK FROM NORFOLK TO NORTHERN MARKETS BY WATER TRANSPORTATION.

LEGUMES.

GROWING CLOVER.

BY JNO. JELLICORSE, IN PRACTICAL FARMER.

There are many crops grown which exceed red clover in money value, but there is no crop in those sections where it succeeds of the same value to the farmer because in growing the legumes in a regular rotation with other crops is summed up the whole question of good farming. When once land is in such condition that a stand of red clover can be secured, success with proper effort, is certain. The complaint that clover will not grow as well as formerly, that it is harder to get a stand, is just as loud where clover growing is only occasional as where it has been grown regularly for years. It seems to be on a par with the cry that we do not have as much rain as years ago. When land was new, rich and full of humus good crops were grown with little effort and rough tools, but a bad system of farming has impoverished the land and the humus is lost. It bakes more and requires careful treatment. If land is in such a condition that it won't start clover it must be improved. The best way to do this is by sowing cow peas, clover's twin sister, early, taking off a crop of hay, then plow the stubble for wheat, on which clover can be sown in the spring. The writer has never used artificial fertilizer nor seen clover-sick land, so knows nothing on these points. Good authorities advise the application of twenty-five bushels of lime per acre when clover sod is turned under, as a preventive or cure for acidity, to which clover sickness is attributed.

In Middle Tennessee clover can be sown in fall or spring; the latter is generally most convenient. If sown in the fall, put eight or ten pounds of seed per acre on well prepared land, between September 1st and 14th, without cover crop. The best stand in spring is secured sown with oats; this seems to be caused by the better condition of the land and because it is generally sown a little later than when on wheat. But oats in this section are not a paying crop, being lighter and not as good feed as those grown North. It is also harder to get them in at the right time on our land, which does not dry out well early in the year. Most of the clover is sown on wheat about March 1st, when the ground is frozen; sometimes late freezes kill it. This year we sowed about April 1st, and in spite of a dry spell seem to have a stand.

After the cover crop is cut come the weeds; they must not be allowed to smother the young clover out; they should be cut before they do any harm, and not left till September. Cut again then with advantage. If there are no weeds, cut just the same, leaving everything on the ground. Stock must

be kept off the next winter; they hurt it badly if allowed to trample it, making it later in the spring, which may cause the loss of one cutting. Clover should be cut early when in full bloom; it makes the best hay, and the earlier the first crop comes off the earlier the second starts to grow. It should have a chance to get a start before the spring moisture is out of the ground. To make good clover hay requires experience and judgment. Many tell when to cut, when to rake and how to cure in the cock, but these rules cannot be followed in practice. The clover should be got in the barn as soon as dry, and should be handled to lose as few leaves as possible. We like to haul from the windrow made with a two-horse rake, and save the labor of cocking; but an eye must be kept on the weather. If it must be piled make the cocks as large as possible with straight sides, pressing down well as made. Clover cocks help in a shower, but will not keep out continued rain, and wet clover is not nice hay; still it is very hard to get it in such a condition that stock cattle won't leave straw to eat it. In hauling from the cocks spread and air the hay before hauling. The second crop makes as good hay for cattle as the first. It is said to slobber horses, consequently the first is saved for them; it also slobbers at times. Often a third crop can be secured, but this depends on the season and the early cutting of the other crops. If seed is saved let it get fully ripe and thoroughly cured, stacked in the field and covered with straw.

The value of the clover crop lies in the fact that it draws nitrogen from the air, forming nitrogen salts in the soil and protein in the hay. As before said, the writer has never used artificial fertilizer, and he cannot believe that the long lists of special fertilizers in some papers lead to good farming. Where clover won't grow cow peas will, and what is the use of paying a big price for nitrogen in fertilizer when it can be got at home for nothing, at the same time giving the soil humus which nearly all the Southern soils need. Try and pump some phosphoric acid and potash out of the subsoil with clover or pea roots, and quit building up a fertilizer trust. Our idea of good farming is growing a rotation of crops, and where more is needed, it is better to buy feed off the place and feed it with clover and other roughness. While clover is of value to the soil, the hay is of equal value in the barn, to mix with other roughness. Shredded corn, sorghum and millet are all lacking in protein but rich in carbohydrates; mixed with clover a better balanced ration is thereby formed and the value of the total food increased.

Smith county, Tenn.

HOW PROFESSOR MASSEY MAKES PEA HAY.

We never could understand the great amount of trouble some farmers, in the South especially, take in making pea vine hay. We have seen them plant stakes with cross-pieces all over the field, to hang the hay on, have seen them make scaffolds of rails like shelves, one above the other, to cure it on; have seen bushes with the limbs on stuck up over the field to tangle the hay on for curing, and all sorts of contrivances, all of which are totally needless, and the use of which would always keep the industry on a small scale. For if the hay from the pea cannot be made as readily and in a similar way to that from clover it will never be general in its use. We have been making

pea vine hay many years and have time and again told in these columns how we make it. We have never had any to mould in all our experience. Pea vine hay cured around poles or on scaffolds exposed to the sun will always lose most of the leaves and the stems will be hard, and, in fact, the whole article will be inferior to that cured with as little exposure to the sun as possible. There is not a particle of difference between the curing of clover hay and the curing of cow pea hay, except that the peas need to stay in the cock longer than clover. If cut too green, we will admit that cow peas are rather hard to cure properly, and it takes longer than if the peas are in the proper state, and the hay is not so good. One advantage the cow pea has over clover. This is the fact that it will stand wetting by rain without serious injury, while clover, half cured, is badly damaged by rain. We have a large lot of peas to cure this season, and anyone is welcome to see the hay when in the barn. We rake into windrows the same day if the weather is hot and drying. If not, let them lie till well wilted. Then rake, and the next day turn and cock, and if the following day the twisting test shows all right, put them in the barn. Some of the best pea hay we ever saw was brought to the Farmers' Institute at Lincolnton, N. C., last year. It was stored while limp in rail pens in the field, and the pens were capped with straw stacks. Never cut the hay till the first pods at least have turned yellow, and when you have it in the barn, let it alone, for if you stir it up while heating it will surely mould. Mr. Beam, we have no doubt, will stick to the twisting test hereafter. We are experimenting with the cow pea this season in order to note the difference in times of planting and methods of planting. All our peas are the Wonderful. We have some that were drilled in rows three feet apart the first day of May, using a little over a peck of seed per acre. At this writing (July 5th) these are over knee high and nearly hide the ground. Another piece was planted the same way the middle of May, and at the same time another piece was sown broadcast at rate of two bushels per acre. The main crop was sown broadcast at rate of one bushel per acre about the 25th of June. These are now just fairly up. We will note the difference in these various plantings with a great deal of interest. We have sown over twenty bushels and intend to save our own seed this year from some of the drilled peas. We are waiting now for rain to enable us to plow for a few more to be sown by or before the middle of July. The general opinion here is that the very early planted peas will make more vine but less peas than the later ones. We want to test this, for as yet we do not believe it. But to come back to the hay. We have no doubt that Mr. Oliver makes a fairly good hay with his method. But it costs too much, and takes too much labor. We will take a great deal of pleasure in showing him our hay when it is cured, and it will be done at half the cost of his method, and we think he will say ours is perfectly good. At least we never made any bad pea vine hay, except in the very hot summer of 1900, when it cured too fast for us, and was dryer than we liked before we could get it in, and it was not as green and pretty as we like to have it.

CURING PEA VINE HAY.

BY C. W. BLACKNALL, OF KITTRELL, N. C.

The cow pea vine is worth as much as the cotton plant to the country, perhaps more, for it grows much further north and thrives on vast regions in which cotton will not grow at all. The cow pea has a three-fold value. Greatest of all is, that it increases the fertility of every acre on which it is grown, and increases it faster and more economically than any other crop as easily, surely and widely grown. Then the pea itself is of a high value as stock food, nor do men with sound appetites despise it? Third, as a forage the pea-vine hay is beyond comparison the best food that we have ever used. Shredded as we shred it its actual value to us is fully twice that of timothy hay. Of course a chemical analysis does not show that difference, though I believe it shows a considerable difference, in favor of pea-vine hay. In estimating its value I consider the great relish of all the animals for it, their superior condition and working capacity, and the lessened ration of grain that will keep them up while fed on it.

The value of pea-vine hay as a forage depends very largely upon its proper curing; probably more than any other forage whatsoever. The curing of it is the simplest, easiest thing in the world. I don't know how I came to adopt it unless it was owing to my belief that the best things are the simplest things, the best ways the simplest ways. Nevertheless this mode of curing is of incalculable value to us. For it not only cures the hay perfectly but there is no worry, no element of uncertainty as in all other modes.

We cut the pea vines with a mower drawn by two horses. One machine, well handled, will cut nearly ten acres a day. A cutting blade could, of course, be used for a small acreage. Right behind our mower follows a force putting up stack poles. Any ten foot pole will answer as it has to stand only a short while. The pole set we nail a strip of wood—readily riven from pine or any wood that splits easily—about four feet long, placing it about one foot above the ground, and immediately above another similar strip nailed cross-wise the first. These strips serve to keep the bottom of the stack of vines from resting on the ground and rotting in wet seasons. Brush will answer as well or even better, though it is not practicable where a great many stack poles are to be protected. We put up about 2,000 stacks every fall. We have cured vines without any rotting at all when no protection at all was used at the bottom of the stack.

Well, the stack poles planted we follow right behind the mower and make stacks of the vines as high as the poles and about four feet in diameter, sloping and smoothing the stacks at the top so as to shed water.

No more attention or thought need be given the stacks till the vines are sufficiently cured to be threshed and shredded. And a beautiful and most excellent lot of forage you will have, too. All cured green and sweet. It tastes sweet, almost like sugar cane. The shredding should be done as soon after the vines are cured as practicable, as the longer the stacks stand the deeper the weather effects the vines. Besides bad weather is apt to come later in the fall and hinder the shredding.

LARGEST PEA PRODUCING COUNTIES IN THE STATE.

Caroline grows the largest acreage in peas, with King William a close second, Hanover third, and Essex fourth.

GROW CRIMSON CLOVER IN WINTER AND COW PEAS IN SUMMER, YOUR LAND CAN'T STAY POOR.

Crimson clover can be sown during the late summer or fall, either by itself or at the last working of corn or cotton. Advantage should always be taken of a favorable season for seeding this crop, as it sprouts very quickly and easily. When sown by itself, it is better always to prepare land intended for crimson clover as early as can conveniently be done, and then wait for a good rain. As soon as practicable, after a rain, run a light harrow over the ground to break the crust of the soil; then sow the seed and cover with a smoothing harrow, brush harrow or roller. A great many of our truckers make it a rule to seed crimson clover on all vacant land as soon as the crops are taken off. It is not at all necessary to replow for crimson clover; in fact, it is better not, if the land is reasonably clean and not too hard or compact. Running a cutaway or sharp-toothed harrow over the land will, as a rule, give sufficient preparation on land where crops have been recently taken off, and better stands will be secured than if the land is freshly plowed. One of the principal reasons why crimson clover sometimes fails to give satisfactory stands is on account of being sown on freshly plowed land, which does not seem to be compact enough to protect the little rootlets against the hot, dry spells which we sometimes experience in the late summer and fall, and on this account it is much better to seed on land that has been plowed some time previous to seeding.

USES, AND VALUE AS A SOIL IMPROVER.

In addition to its great value for pasturage, early green forage and hay, crimson clover is unquestionably one of the best soil improvers the farmer can use. It not only adds to the fertility of the soil, but puts the land in excellent condition for the crops which are to follow it. It also prevents the winter leaching of land, conserves its fertilizing constituents, and will increase the quantity and quality of crops following it, wherever it is grown. Its use is increasing very rapidly, and it is only a question of its merits becoming fully known, when it will be appreciated and considered as one of the most important crops for farmers everywhere.—*Exch.*

HAIRY VETCH.

Hairy vetch is a valuable winter legume. Like crimson clover it grows in winter and gathers nitrogen from the air, conserves the winter moisture, and is easily grown on poor sandy land. It will reseed itself if left alone.

COW PEAS AND INTENSIVE CULTURE.

A man may have a very limited area under cultivation, but if he will keep part of that in cow peas, plant a still less acreage to cultivated crops, and with more intensive cultivation, and then keep alternating his tillage land with cow peas or clover and commercial crops, he will soon grow to be a very "big small farmer," or else a larger one; he simply cannot help himself. Cow peas will force him into prosperity.—*Rural News.*

One acre of good cow pea hay will make as much protein, the muscle and milk-makers, as two tons of wheat bran, and at one-half the cost, and the land is better after growing the peas than before.

LET US REPEAT A FEW FACTS.

When the farmer grows any of the legumes, either red or crimson clover, cow peas, vetch, soy bean or any of the legumes, he is doing two things that will always improve his soil. He is getting nitrogen in the cheapest way possible for him to get it—at the rate of from $5 to $20 per acre, according to the yield of the crop. He is putting in his soil vegetable matter to decay there, which must always be in the soil before heavy crops can be grown. This decayed vegetable matter is called by a short name, *humus*. This humus makes the land soft and friable; it prevents it from breaking up cloddy or forming a crust on the surface. This humus increases the capacity of the soil to hold moisture. The yield of the soil is largely in the power it has to hold moisture; all of our crops are drinkers, not eaters. The humic acid produced by the humus also gradually dissolves the insoluble potash and phosforic acid that is found in sufficient quantity in all soils, and makes it soluble and ready to feed the crops. These are most important facts, and worthy of careful consideration, and will, if practiced year by year, reduce the use of commercial fertilizers, improve the soil and increase the profits in farming.

GROWING KALE IN NORFOLK COUNTY.

TRUCKS AND VEGETABLES.

SELECTING AND SAVING SEED POTATOES.

C. L. ALLEN, LONG ISLAND, N. Y.

Should farmers save their own seed potatoes, is a question frequently asked. It is promptly answered yes, when asked by a Long Island farmer. Because those who save their own stocks for seed purposes and use proper care in selection are, as a rule, the most successful. In this locality, as in all others where the potato is successfully grown, there are some districts and some particular farms which are famous for producing enormous crops of potatoes, and where the whole crop is frequently sold at high prices for seed purposes. In such localities we generally find that such advantages arise not less from the nature and properties of the soil being favorable to the production of the potato, than from the infinitely greater care and attention which is paid to the crop.

In the selection of seed, and choice of varieties, there is but one safe rule to follow. Procure it from that place where it is the most perfect and healthy, where the yield under favorable conditions is the largest, and where the character of the soil and the conditions of climate are similar to your own.

The development of the potato as to quality and productiveness is more due to proper care in selection for seed purposes than to all other causes combined. This care is a simple matter, so simple that its importance is rarely understood or appreciated. The usual one of selecting the most desirable tubers from the bin at the time of planting is but the first step in the line of improvement, and that step often a mistaken one, as the ones chosen may be the only ones to be found in a hill, and the ones selected may represent as many hills as there are specimens selected.

The proper method to pursue is to go over the field at the time of harvest, select vines that are strong and stocky, not long or straggling. Carefully take up with a fork, and if the potatoes in that hill or from one given vine are all of a uniform shape and of a desired size, such are the proper ones to select for stock, and none others. One of the laws of reproduction is that "like produces like," and where there is but one well-formed potato in a hill or from one vine, the offspring will too closely resemble the parent. We are familiar with this practice, and know the results are of far greater importance than we have stated, that the annual crop is more than double that where the ordinary methods of taking the best-looking specimens from the bin are followed and the quality is better.—*American Agriculturist.*

MARKET FOR POTATOES.

The new market for potatoes that is rapidly increasing in the tropics is not yet half appreciated by potato growers and dealers. Here is Governor Hunt reporting that during the past twelve months, Porto Rico alone imported $500,000 worth of potatoes from Spain. Under the treaty of Paris, Spain has entry into the markets of Porto Rico, Cuba and the Philippines under the same conditions as the United States, until 1908. Therefore Spanish produce and manufactures are entitled to free admission into Porto Rico and into the Philippines at a reduction of 25 per cent. from the rates of duty prevailing in the United States. But it goes without saying that America can produce potatoes more cheaply than Spain or any other country, and every bushel of potatoes consumed in the tropics should come from this country.

TOMATO LEAF-SPOT AND MUSKMELON BLIGHT.

A. D. SELBY, BOTANIST.

The Ohio Experiment Station warns tomato growers to be on the alert for tomato leaf-spot and to begin early in their measures for its prevention. The prevailing wet weather is favorable to this disease which may again prove as destructive as in 1898 and 1900. Spraying the plants with Bordeaux mixture at intervals of two to three weeks promises very large returns should such moist weather continue.

Gardeners and truckers are also warned to begin spraying for the downy mildew of muskmelons and cucumbers, should their plants promise to yield after the middle of August. Earlier spraying for this disease was not required, but from the present date forward, treatment should be made at intervals of eight to ten days if a late yield is anticipated.—*Ohio Bulletin.*

"THE FINEST CONCENTRATING POINT FOR THE TRUCKING INDUSTRY IN THE WORLD."

The above is what the Government says respecting the Norfolk trucking and market gardening section. To develop a great industry like the trucking industry there must be several factors. There must be a soil, a climate, and a market.

In addition to the above the great bulky crops of farm produce must be quickly, cheaply, and easily moved to the great consuming centres. In this very, very important respect (cheap freights) the Norfolk section has no superior, and in fact no equal on the North American Continent.

We desire to call attention to two views in connection with this topic. The "Arms of the Sea" penetrate the land here in all directions. Each farmer of any importance along all these "arms" has his farm wharf, at which little steamers or sailing vessels lie and are loaded with the products of the farm, and then hoist sail and glide away to the wharves in Norfolk to unload and return for more. It often happens that the wind and tide are against these little sailing vessels, and it is slow work beating their way into the harbor.

At such times, say about 2 P. M., the transportation companies in this harbor send out tugs to gather up the belated little sail vessels and tow them alongside the docks. The cut shows one of these tugs with a small tow of vessels. We often see as many as ten to fifteen of these little sailing vessels trailing along after the tug, looking very much like an old mother duck with her ducklings strung out behind her.

This view shows these little vessels unloading at the docks. This particular dock shown is that of the Old Dominion Steamship Company. The little vessels with their loads of truck gather around the dock often three and four deep and wait turn to unload. These docks cover several acres of ground, and are literally as full of colored laborers as an ant-hill is full of ants.

There is no busier scene, nor one more attractive, than to view this army of laborers unloading farm produce from these little sailing craft and transferring it to the great steamers for New York and other northern points.

The steamer shown in this view will carry 25,000 packages of farm produce to New York at a single trip. These packages will be mixed—barrels, baskets, boxes and crates. If these 25,000 packages were set on end, so as to occupy the smallest amount of space, they would cover two and one-half acres of ground.

From six to eight of these steamers leave each week, and they are all loaded with farm products, especially during the busier season of April, May, June, and July. There are no farmers in the world enjoying such splendid facilities for getting the great bulky farm crops from farm to market, as is enjoyed by our farmers in the "Venice of America."

Yours, etc., A. JEFFERS.

Norfolk, Va.

A FIELD OF KALE IN MID-WINTER.

The kale and spinach crops of Eastern Virginia are assuming greater proportions each year. The above photo was taken just before Christmas, and many such fields, many much larger, and some more luxuriant could be seen around this seaport. This crop is usually planted in August. It is generally drilled in in single rows with a wheel drill pushed by hand.

It is used entirely for "greens" and finds a market in New York, Boston, Philadelphia, Washington, Baltimore, and through these cities as gateways it finds its way to all northern and western cities. The crop is going to northern markets almost daily now and this will continue all winter or until the crop is all marketed, as this is one of the years when everything green sells well. The crop yields as high as 300 barrels per acre, and in some instances even more, depending on the variety grown, the soil and the season. A fair yield is 200 barrels per acre. The price ranges from 75 cents to $1.25 per barrel. It is a cheap crop to grow; but is not considered as profitable a crop as its sister crop—spinach.

Spinach is planted a little later in the fall, say in September or October. It is a smaller plant than kale, and is also used for "greens." The yield per acre is from 100 to 200 barrels per acre. Larger yields are frequently made. The price is from $1.25 to $3 per barrel, frequently reaching $4, $5, and even

$6 per barrel. A very large acreage of spinach is planted and now growing for the northern markets, which are more bare than before for years. The spinach and kale crop this year will certainly exceed a half million barrels.

The freight rate to New York or Philadelphia on kale and spinach is only 15 cents per barrel; on cabbages the freight is 17 cents per barrel; on potatoes, 20 cents. The soil of Eastern Virginia is especially adapted to these and kindred crops. It is mellow, warm and dry. In sunny nooks where the north and west winds are cut off, these crops grow slowly all winter long. The kale and spinach crop covers at least 3,500 acres in extent.

Virginia largely excels any other State in the production of kale and spinach.

CELERY CULTURE.

Under favorable conditions celery is the most profitable crop grown.

The growing of celery on a commercial scale is with few exceptions a new feature to the truck growers. The general impression has been that celery requires a particular kind of soil, and that the ordinary trucking lands will not produce an average crop. It is also believed that the climatic conditions were not suited to the best development of the plant. While it is true that the average trucking soil of Maryland is not an ideal soil for celery, it can be grown successfully on most lands, provided a certain amount of care is taken in the selection, preparation and fertilization of the land. The proper time of planting, spraying, watering and cultivation are also important factors on which success is often dependent.

SOIL.

The ideal soil for celery is reclaimed peat-bogs or muck lands. These are composed almost entirely of vegetable matter, and when sufficiently drained and decayed produce the best quality of celery. The famous celery lands around Kalamazoo, Mich., are nothing but reclaimed peat-bogs; so are the extensive celery lands in Southern California. In the absence of such lands, celery may be grown quite successfully on ordinary garden or truck lands well-tilled and fertilized. The most essential point to bear in mind is that the land must be rich in humus or vegetable matter. For this reason soil intended for celery should have previously been given a liberal dressing of stable manure from forty to fifty tons to the acre, and allowed to decay before the land is planted in celery. Or if this cannot be had, several crops of forage crops should be plowed under and allowed to decay. For celery the soil cannot be made too rich in humus. Next, the soil should always be deep and mellow. It is generally advisable to grow several crops of other vegetables on the land until it had reached a high state of cultivation. The land should be thoroughly plowed with a sub soil plow to the depth of twelve to fifteen inches. Heavy clay land will, as a rule, not grow good celery and should be avoided. If clay lands are the only ones available, they should be plowed deeply with a sub soil plow, and large dressings of barn-yard manure and green crops should be applied before the celery culture is attempted.

WATER.

The importance of water in celery culture is often overlooked. The annual rainfall in most sections of the country is rarely sufficient to grow the best possible crop, and some means should be provided whereby the celery plantation can be watered during the dry spells. If the grower is so located that a stream or a creek can be diverted to the land he is most fortunate. If it is not possible, then gasoline or windmill power may be used. The cheapest and most effective means will readily suggest itself to the grower. The local conditions will also serve as a guide in this matter. Sub-irrigation has been tried with some success, but in many instances it is both expensive and impracticable. Watering with a hose or by letting in a stream of water between the rows of plants or even in the bed itself is generally the best and most economical way. After each application of water and after each rain, the land should be stirred as soon as the land will permit to break up the crust formed, and to prevent excessive evaporation. This is very important, and should never be overlooked. The more humus the soil contains, the greater will be its water-holding capacity, and the less occasion will be for watering.

FERTILIZERS.

The celery grower should never rely upon use of commercial fertilizers as a substitute for barn-yard manure or manure derived from the use of cover crops. If the soil condition is not what it ought to be it cannot be made so by the use of commercial fertilizers. Nothing can take the place of well-rotted barn-yard manure applied at the rate of forty to fifty loads to the acre, and plowed under to the depth of eight inches. The land should, if possible, be planted to some hoed crops after the manure has been applied, so as to permit it to become thoroughly incorporated with the soil. The soil must be in uniform tilth before it is planted to celery. Commercial fertilizers in the form of nitrate of soda may be applied with good results in the fall of the year, when due to the cold weather, the nitrifying agencies in the soil are not active, and the plants can then make good use of it, it being soluble and immediately available to the plants. It should be applied at the rate of three hundred to four hundred pounds to the acre. In applying commercial fertilizers be sure that they do not come into direct contact with the plants, as they will generally injure them, and in many instances cause death to the plant.

SOWING THE SEED.

The seed for the early crop should be planted from the first to the fifteenth of March in hotbeds. These are made in the usual way. It is sometimes advisable to transplant the seed into cold frames to produce stocky and healthy plants. Shearing off the tops of the young plants is also done to make the plants stronger. For late crop, the seed may be sown in the open ground in a well-prepared seed-bed. The soil should be a rich, sandy loam, and in fine tilth, and plowed to a depth of at least ten inches. The size of the bed is a matter of convenience, long and narrow ones being preferable, as they

are more easily and economically cultivated. Soils which have a tendency to bake after rain or watering should be avoided for seed-beds. The seed should always be sown in rows from six to eight inches apart to facilitate cultivation and working.

There are two general methods of field culture. One is to plant the seedling in rows five feet apart, and the plants six inches apart in the rows. Where the soil is not apt to wash badly, the plants may be set three or four inches below the surface, and the land plowed out in the manner corn is listed. Where the soil is apt to wash badly, planting below the surface should not be done, as it will often cover the plants over with soil washed down upon them. By this system, the plants may be blanched very cheaply as the soil may be moved around the plants by the use of horse labor and a larger acreage can be cared for.

The other method is what is termed the bed method. The plants are planted in rows six or eight inches each way. The beds should be from eight to ten feet wide and any desirable length. If more than one bed is to be used, a space of eight to ten feet should be left between the beds for the soil to be used for filling in between the rows of celery for blanching. It is understood that the land should be put in the best possible shape before planting both as to fertility and physical condition. It is often desirable to sink the beds to about four to six inches below the surface of the soil, so as to facilitate the filling of earth for blanching and to prevent too rapid evaporation of moisture. If this is done, less space will be needed between the beds.

PLANTING.

In the single row method, the furrow (if the celery is to be planted below the level) can be opened up with a shovel plow. It may be necessary to go over the same furrow several times to obtain an even and smooth furrow. Care should always be taken to get the plants in straight rows. To obtain this end, the line should be frequently employed.

After the furrow has been laid out, the edges of loose soil should be raked off and the soil on the sides and on the bottom of the furrow made smooth and fine to prevent washing and covering up of the plants. It is generally advisable to cut off about half of the tops of the young plants and also to trim off the longest roots. The young plants should be dipped in a puddle made by adding clay loam to water before planting. This will form a coating around the roots and in a measure protect them from drying out, while being planted. Planting should not be done during dry weather or during the warmest part of the day. Immediately after a good rain is the best time for planting. If the planting is to be done in single rows and on the top of the soil, the rows should be laid out with a line and the soil raked smooth and fine along the line of planting. In the bed system, whether submerged beds are used or level culture, the planting should be done from the sides of the bed to prevent unnecessary packing of the soil, and for this reason, they are made narrow enough to permit the planter to reach over one-half of the bed from either side. The rows are conveniently laid out as follows: A line is stretched from one end to the other through the middle of the bed. This line

is to serve as a guide for the marker, which makes the rows. The marker can be made by the grower himself and will be found a very useful tool.

THE TIME TO PLANT.

The time to set the young plants into the field depends upon whether early or late celery is wanted. If late celery is to be grown, the plants should be set from the first to the fifteenth of July. A crop of early peas or early Irish potatoes may be grown on the land first. Such crops will tend to pulverize the soil and bring it into fine tilth, before the celery is planted. Care should be taken to have the land rich enough to provide an abundance of food material for both crops. If an early crop is wanted, the plants should be planted into the open ground as soon as all danger of heavy frosts is over. Light frost will, as a rule, not injure the plants.

CULTIVATION.

The celery plantation should be cultivated once every ten days. Once a week would be still better. It may be stated as a fact that almost all growers cultivate too little. Thorough and frequent cultivation is as important as the application of fertilizers.

A fine-toothed cultivator is the best implement, as it leaves the soil fine and even. The soil along the row of plants and around the plants should be loosened up and fined after each cultivation. The plantation should always be cultivated and hoed as soon as possible after a rain. It should always be borne in mind that the young plants must be kept growing without check in order to produce the largest crop and finest quality. Plants, which have become stunted or dwarfed through careless and deficient cultivation, will not produce the finest quality. One often sees large plantations of young plants, which remain stationary for two or three months during the hot part of the season, and then they are expected to produce a crop, when the cool weather of the autumn comes. This is entirely wrong. No plants so treated can possibly attain the highest perfection. Do not sow the seed for both the early and late planting at the same time. The plants for late planting will be too old and woody before it is time to transplant them into the field.

If possible select a cloudy day, on which to do the planting. If this is not possible, it may be done late in the afternoon and evening. The planting is generally done by the aid of dibber or a stick, with which holes are made. The trimmed plant is then placed in the hole and the soiled is firmed about it. Care must be taken to get the hole filled well clear down to the bottom, otherwise there will be an air space, which may cause the death of the plant. If dry weather should follow the planting, it is sometimes necessary to resort to watering. Frequent and thorough cultivation will often prevent the drying out.

SPRAYING.

The importance of spraying cannot be overestimated. It is seldom possible to grow a clean crop of celery without it. There are two species of blight, which generally attack the celery. One is termed the Early Celery Blight, *Cercospora Apii*, and the Late Celery Blight, *Septoria Petroselini, Var.*

Apii. The former often makes its appearance in the seed-bed and immediately after the plants have been set into the field. The fungus first makes its appearance on the ends of the leaves in small circular spots, which rapidly increase in number and extent. The spots are at first dull green in color and gradually change into a pale brownish yellow color. The disease spreads very rapidly during hot moist weather. The late celery blight seldom makes its appearance until autumn, and does most of its damage after the crop is grown and in many instances large losses have been caused by it in the storage cellar. It is easily detected by reason of the dark, spotted appearance of the leaves and stalks.

REMEDIES.

In most cases little attention is paid to the diseases until they have done considerable damage. The real value of a fungicide lies in its preventive powers. After the disease has once gained a strong foothold, it is next to impossible to cope with it as the damage is already done, and the most a fungicide can do is to keep it in check.

Numerous experiments, with a large number of fungicides on these two blights, have demonstrated that the most effective one is the standard ammoniacal solution of copper carbonate. The following formula is recommended:

Copper carbonate, 8 oz.; Ammonia water, (26) 3 pts.; Water, 48 gals.

In order to be most effective, the young plants should be sprayed two or three times while in the seed-bed, and once every ten days or two weeks after they are transplanted into the field. It is advisable not to make the application in the middle of the day, as the leaves are apt to be slightly injured. Late in the afternoon or evening is the best time to make the application. (For results of spraying for the prevention of celery blight, see Bulletin No. 74, of this Station.)

MULCHING.

Mulching of the celery plantation is to be recommended especially if the soil is light and subject to drought. Beside checking evaporation, a good mulch shades the soil and keeps it cooler than if it were left bare. The best material for mulching is well-rotten stable manure. It should be spread out between the rows and around the plants immediately after they have been set out. In order to be more effective, it should be applied from two to three inches thick. If not enough material is available to cover the entire distance between the rows immediately around the plants, the distance of eighteen inches or two feet may be covered with good results. Green clover is sometimes used for a mulch, and with good result. The clover should be cut before the bloom, as to get the largest amount of leaves and succulent materials, and should be put on about six inches thick. Clean straw and strawy manure may also be used, but the great objection to the use of these materials is that they always carry foul weed seed with them, besides being difficult to remove when the time for blanching comes. The mulch should be applied about the first week in June for early celery, and about the first week in July for late crops, the object being to keep the soil cool and moist during the

hottest part of the summer, where, under ordinary conditions, the celery plants make little or no growth. Before blanching commences, all of the coarse mulch should be gathered up and taken off, leaving no refuse behind. The soil used for blanching must be mellow, and, if possible, entirely free from partially decayed vegetable matter. For this reason, it is better not to use partly rotten stable manure for a mulch, as it cannot be thoroughly incorporated into the soil before it is used for blanching, and it is very apt to produce spotted celery by coming in contact with the celery stalks.

July and August are the hardest months on the celery, and, during these months, the plants are very apt to become stunted and dwarfed in their growth. To prevent this mulching is recommended, or, if water can be had conveniently, the plantation should be watered frequently and kept well cultivated after each application of water.

BLANCHING.

The object of blanching is to obtain white, crisp, and tender celery. Blanching eliminates the original green color, the bitter taste, and the natural tendency of the stalk to become tough. The most general material used in blanching is earth. There is considerable difference of opinion as to the time when the celery ought to be blanched. Many successful growers practice the system of gradual blanching; that is, the soil is banked about the plants at different times through the growing season, and by the time the celery plants

The "new celery culture" method of blanching.

have reached their maximum growth, they are already blanched and ready for the market. It is claimed, and not without reason, that celery so grown is better in quality. The stalks do not remain out of ground for any considerable length of time, and have little chance to become tough by long exposure to the atmosphere. Gradual banking also tends to keep the soil around the

roots of the plants cooler, but this is not always the case. If the blanching is done gradually, care must be taken to have the soil fine and not to leave any air space around the stalks. Gradual blanching will, as a rule, also produce a whiter and more solid stalk. If the plants are allowed to grow the whole season without banking, they will have a tendency to spread somewhat and the leaves must be tied together before the blanching process is undertaken. If the single row system has been employed in growing the plants, the blanching is a very easy matter. Furrows are plowed against the row of stalks and then the soil is worked and packed in between the plants. After this has been done, furrows are again thrown against the rows and the soil worked against the plants. This process is repeated until enough earth has been packed about the plants. The sides of the banks are then raked smooth and rows left until time for digging.

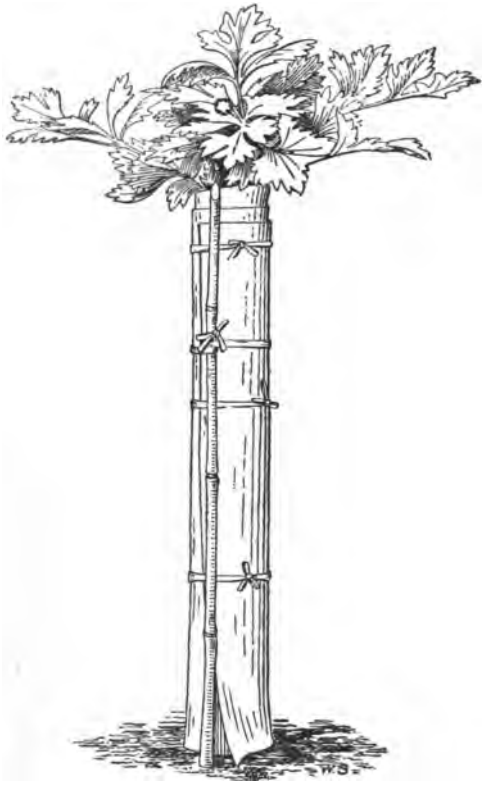
If the plants have been grown in beds, the cost and difficulty of blanching is much greater. The land between the beds is first plowed as deep as possible and then made fine with a pulverizer, drag-board or harrow. The earth is then shoveled by hand, in between the rows, until the plants are covered to the desired depth. It is generally necessary to tie the leaves of the stalks together before the process of blanching begins.

BLANCHING CELERY WITH BOARDS.

Many growers employ a board in blanching. This is to protect the center of the stalks and in a measure to keep the leaves together during the process.

After the soil has been filled in, the board is taken out and put in place for the next row. This practice is being superseded by simply holding the leaf stalks together with a cord and then press the soil well around the stalk. The center is then well protected and, besides, there is no danger of leaving any air space. The stalks will also be more uniformly blanched and more compact in form. The cord should not be tied around each stalk, but simply wound around them, and then carried over to the next stalk without breaking. The cord should be wound close to the top of the plants, just below the fork of the leaf-blade so as not to injure the stalk.

Blanching may also be done by the use of paper, either wrapped around

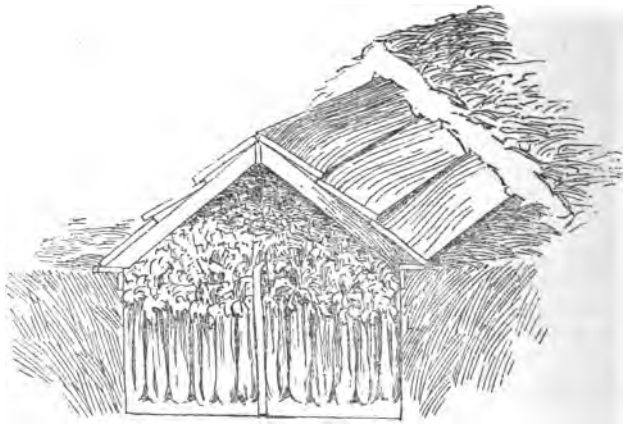


BLEACHING CELERY WITH PAPER WRAPPERS.

the stalk and kept in place by tying a cord around it, or paper cylinders of desired size may be made out of a building paper, and these placed around the plants. Blanching may also be done by using boards. Boards of the required length are placed one on each side of the row, and kept in position by sinking the lower edges into the soil about two inches, and by driving two nails opposite each other on the upper edges and by tying these together by means of a stout twine. These methods are not recommended to be used in a com-

mercial scale. They are, as a rule, less effective than earth, besides the quality of the celery so blanched is, as a rule, not uniform. They may be used in a small way, and good results may be obtained if the work is done carefully.

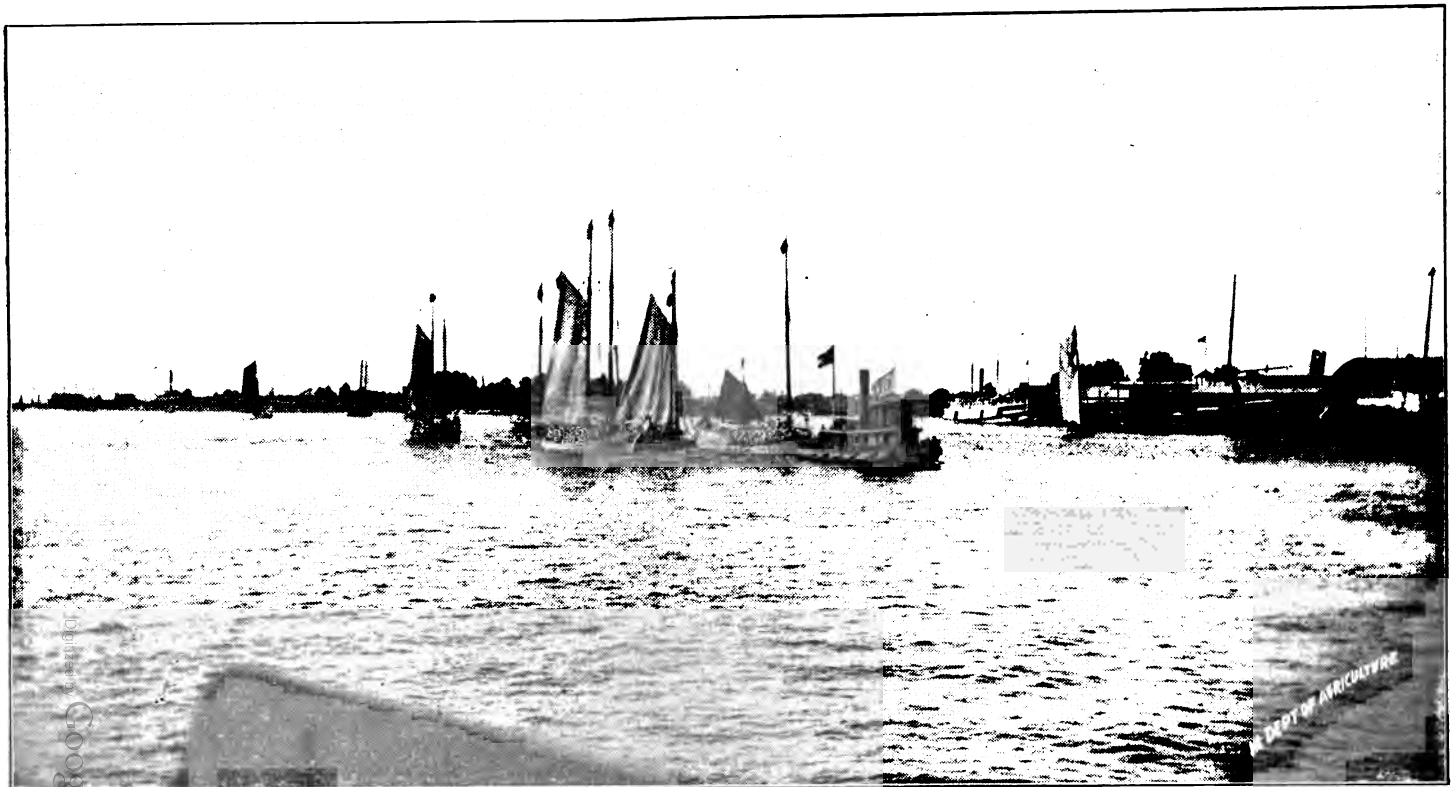
If the celery is to be stored for late use in the spring, the keeping qual-



A METHOD OF WINTER STORING CELERY.

ities are greatly increased by blanching the celery during the period of storing. The stalks should be kept growing until danger of damage from frost without any banking of earth. They are then taken up and stored away green.

The writer is of the opinion that the system of gradual blanching and filling in of soil is better suited to the soil and climatic conditions of Maryland. Some experimental work along this line will be carried on this season.—*Maryland Bulletin* 83.



TRUCKERS NEAR NORFOLK SENDING THEIR PRODUCTS TO MARKET BY WATER TRANSPORTATION.

DAIRY.

CLEAN, COLD MILK.

A New York dairy, a New Jersey dairy and an Illinois dairy each sent milk to the World's Exposition at Paris in 1900, which was sweet 15 to 21 days after it was drawn from the cow. How are these things possible? By extreme care in excluding dirt of every kind with its load of bacteria, then keeping the milk so cold that the bacteria which do get in in spite of the care cannot grow rapidly.

Milk sours because in the process of growth and multiplication of the bacteria the milk sugar is changed to lactic acid. When there is enough acid present to be apparent to the taste, the milk is said to be sour. Bacteria, like corn or any higher form of plants require food, moisture and sufficient heat in order to grow and multiply. Milk has the necessary moisture, is a perfect food, and is usually at the right temperature for rapid growth of bacteria. Since the keeping quality of milk bears a direct relation to the bacteria which gain access, it is important to prevent their getting into the milk. The udder and adjacent parts of the body which are much shaken during milking is one of the chief sources of infection, while the dust of the stable, the hands and clothes of the milker, together with the pails and cans used, are only slightly less important sources. Experiments show that: milking in a stable where the circulation of air can carry the dust out, wiping the udder with a damp cloth, and scalding utensils with live steam or boiling water, will not only reduce the bacterial content of the milk, but increases the keeping quality of the milk materially. A covered milk pail, with only a small opening to milk into, reduced the number of germs falling into the pail one-fourth as compared with a common pail, and the milk kept sweet 20 hours longer. Immediate cooling after milking is next in importance. Milk allowed to stand two hours without cooling contained 23 times as many germs as when milking was finished, while that which was cooled to 54 degrees, only had four times as many at the end of two hours. This emphasizes the importance of quick and thorough cooling.

Milk when first drawn has a peculiar flavor, or "cowy taste" more or less noticeable, which if not driven off by aeration (exposure to the air) frequently gives the milk an unpleasant taste even before it becomes sour. Aeration may be accomplished by stirring or by pouring from one vessel to another. The can of milk may be set in a tub of water to cool. The cooling and aeration may be better and quicker done by running the milk over a combined cooler and aerator, such as the Star, Champion, Perfection or other similar appa-

Financial Outcome.—[If it is assumed that apple pomace costs at the farm a dollar a ton] "the corn silage ration fed 270 days * * * cost $3.78 more [than did the pomace ration]. Less butter was made on the corn silage ration, the shortage being equivalent to $1.28, but the ration contained $1.59 worth more plant food. * * * The difference is in favor of the silage. Its added cost, however, causes a loss of $3.47. If the plant food is not considered an asset, the loss is much greater * * * approaching two cents a day * * * Viewed from both standpoints, the feeding value and the financial outcome, apple pomace is as good as corn silage." *Mss. fifteenth report (1902) in press.*

These repeated experiments seem to be sufficient to demonstrate the value of this usually despised product. Twenty or more cows have been in four different years fed from 10 to 16 pounds daily. Some were fed in four-week periods, alternated with corn silage, and two were fed for twenty weeks continuously without trouble of any kind being experienced in the health of the animals or the quality of their products. The rations of the only mature cow continuously fed for nearly five months with a pomace ration was 16 pounds hay, 8 pounds corn silage, 16 pounds apple pomace silage and 8 pounds of a grain mixture carrying by weight 2 parts of bran and 1 part of equal weights of cottonseed and linseed meals. Her milk yields in successive four-week periods on this unchanged ration, of which a fifth of the dry food matter was derived from the apple pomace, were 465, 439, 428, 420 and 418 pounds. She was six and a half months in milk at the beginning of the feeding, and was served nearly two months before the first period opened. A two-year-old heifer, eating for nearly five months continuously a ration one-fourth of the dry food matter, of which was derived from apple pomace, gave in the successive four-week periods 253, 244, 230, 229 and 233 pounds of milk. She was also six and one-half months in milk when the tests began, and was served a week after the trials opened.

UNFAVORABLE REPORTS.

It is but right, however, to state that reports of quite different results have come to the station. Mr. G. W. Allen, of Essex Junction, says that his cows showed an extreme shrinkage in milk yield occurring coincidently with the substitution of pomace for corn silage. An abrupt change in feeding was made. No such experience has been met at this station in four season's feeding with pomace when a gradual change was made from one to the other ration, consuming, say three days, and when some corn silage, say one-third of the weight of silage fed, was used.

There is, moreover, a somewhat general notion prevalent that apples will cause trouble in cows when freely eaten, a notion borne out by the facts in several cases. Nothing of the kind has ever been observed at this station, but possibly our cows are watched closer or are immune. It would doubtless be well, however, for those who may decide to feed apple pomace to use it at the outset with a sparing hand.

ENSILING APPLE POMACE.

It has been the custom at this station in ensiling apple pomace simply to dump or shovel the material directly into the silo, either on top of corn silage or not as circumstances suggested, to level it off as required, to let it lie uncovered and unweighted until wanted—which last year was about two months. The silage has usually spoiled to a depth of about three inches, becoming quite moldy. This spoiled silage has served admirably as a blanket, and has helped to keep the remainder in good shape. It has kept well with us until far into the spring. The silage has an odor somewhat more pronounced than a thoroughly good silage from mature corn.

BUTTER FROM APPLE POMACE FEEDING.

Samples of butter made from milk given by cows fed on apple pomace were taken last winter and spring, but at the time of the present writing their analyses have not been made. Neither the careful inspection of the station buttermaker nor the remarks of critical private customers have indicated any fault with the product.

(It is trusted that this article may be of some service in calling the attention of dairymen in the apple belt to a waste product of much food value, which ought to be utilized. Let not a pound of apple pomace go to waste this fall behind the cider mill.)—*Vt. Bul. '96.*

MISCELLANEOUS.

ESSENTIALS IN CRANBERRY CULTURE.

BY HENRY M. COBURN.

Although the cultivation of cranberries on anything like an extensive scale requires a large financial outlay, it is one of the most profitable crops raised. It may cost from $200 to $250 to prepare an acre of ground, yet in good seasons the yield is large, and enterprising growers usually make money. The grower who wishes to guard against loss will judiciously select the ground he intends to cultivate.

The land should have a peat bottom, and may be a swamp covered with trees, or merely turf and grass growing over a shallow layer of muck. The heavy swamp is to be preferred, so that for purposes of irrigation a considerable stream of water may run through the bog. Flooding in winter to protect the vines from frost and in the fall and spring to destroy insects is the reason for choosing a site where a creek or a large brook flows through the grounds. The trees and bushes having been cleared off, the next step is to dig ditches through the proposed cranbery meadow and also lateral ditches in various places as required.

At the lower end of the bog a substantial dam is built with a suitable gate. The surface of the bog is leveled with turf hoes and from three to six inches of sand is spread over the bog. Between April 15th and June 10th the vines may be set. About half a dozen cranberry cuttings are pressed into the ground to the depth of from three to five inches, with a dibble, and these bunches are planted about eighteen inches apart each way, the ground having been previously marked off into squares for that purpose. Then the ditches are nearly filled with water, especially in a dry season. A full crop of berries need not be expected until the fourth season after planting. The bog must be kept free of grass, weeds and bushes that grow more or less every summer.

Formerly the picking was done by hand, but of late years various picking machines have been used. One pattern consists of a wooden box having round wooden teeth twelve inches long projecting from the lower edge. A handle is attached to each side of the scoop, and the gatherer uses both hands to work the implement. Scoops with wire teeth are also employed, while various other devices for harvesting the crop have been patented. After the berries are gathered they are placd in screens having slatted bottoms. The very small berries drop through, while the defective ones are picked out by hand. By the use of improved picking and sorting machines the cost of har-

vesting a cranberry crop has been reduced from $3.50 per barrel in 1875 to $1 to $2 in 1901.

The cranberry has many enemies. Among them are the fire worm, which oftentimes proves very destructive. It is also called the vine worm. Flooding a bog early in the season, just as the young are hatching, has proved a very satisfactory means of destroying these pests. As many bogs do not have a sufficiency of water for such irrigating purposes, the growers resort to insecticides and spraying. Sometimes a strong solution of tobacco is used, while others have found it very satisfactory to employ paris green. There is also a fruit or berry worm which is fought with paris green or arsenate of lead, put on the vines just after the berries have set. There is a root worm which works much like the common white grub does in a farm or garden. Flooding in August and September will generally give most of these root worms their quietus.

After the berries have been run through winnowing or separating machines, in addition to the sorting, they are ready to pack for market. They are put in bushel boxes formed of slats and having a wooden partition down the center, so as to give the box greater solidity. But most of the crop is put into barrels holding 100 quarts. Some growers consign their crop to the large cities of the Middle States and of New England.

WHAT GINSENG PROMISES.

BY H. D. BIGGS.

Undoubtedly there are great possibilities in the business of growing ginseng, not only for its seed and for plants, but also for the commercial root. But whether the prospect is as bright for the ordinary soil-tiller, and whether it be safe to induce a large number of farmers, by pictures of fabulous profits, to attempt ginseng culture on a commercial scale, is another question. Ginseng, in my opinion, is a proper subject for the expert horticulturists and specialists, and if treated with the skill required for the business and under otherwise favorable conditions, will undoubtedly pay, and pay well, although the undertaking, like that of setting fruit trees, will demand time and patience, especially in regard to the returns. The following article, written by a ginseng specialist, seems to me trustworthy, and will prove interesting to the many who are inquiring about ginseng growing and the profits to be expected from it.

Questions are frequently asked if ginseng can be cultivated successfully who buys the root and the average price per pound. Experience has fully demonstrated the fact that ginseng can be cultivated successfully in the appropriate soil in any part of the United States and Southern Canada. The open ground is the most suitable place for ginseng. While the forest culture furnishes the shade desired, the roots of trees rob it of both substance and moisture. The soil should be rich enough to raise good garden vegetables and slightly sandy to prevent baking. We prefer ground sloping to the north or east. It can be grown successfully on land that is level or sloping in any direction. Ginseng will not grow unless shaded. We set posts in the ground

and build a frame work over the beds high enough to walk under. Over this throw brush until we have a shade. If more convenient, use lath for covering, nailing them on one-half inch apart. To prepare the beds, we dig or plow the ground deeply and pulverize thoroughly, taking out all rubbish that may interfere with the growth of the roots. We lay off our beds four feet wide and any length desired, leaving two feet between the beds for walks. After the ground is prepared, the seed and roots planted, it is but little work to care for the roots until they are ready to dig for market. Keeping the beds free from weeds is necessary. Ginseng will stand a drought better than any other crop the farmer can raise. Ginseng we consider the best paying crop grown. A bed 10x30 feet will bring you hundreds of dollars yearly. Women as well as men are interested in cultivating the plant, from the fact that after the shade is provided for the plants a woman can do the rest. Ginseng has been increasing in value since 1860. That year, according to the U. S. statistics, the average price paid in our home markets was 50 cents a pound. In 1870 the average price per pound was $1.17; in 1880, $2.13; in 1890, $2.71; in 1895, $3.54; in 1896, $3.86; in 1897, $4.71. These prices were paid for the wild root, which is now about extinct. The cultivated root has taken its place and commands a much higher price. It sells in our home markets from $6 to $9 a pound. The best markets at home are New York, Boston, Cincinnati, Philadelphia and San Francisco, as from these points it is shipped direct to China. It is estimated that there are 450,000,000 Chinese who use the root daily. The root is used by them for medicinal purposes. They use it the same as tea is used by the people in the United States, also for seasoning meats. About three pounds of green cultivated root are required to make one pound of the dry root. The roots continue to increase in size and value until at least eight years old. They may be dug and dried any time after they are three years old, with great profit.—*Practical Farmer.*

Texas Co., Mo.

DIFFERENT METHODS IN DRAINING WET LAND.

A. L. Hanson, Grayton, Md.: On my mother's place there is an underground drain about 200 yards long, which was dug by my grandfather over sixty years ago, that is in good working order to-day. I don't know the material used in filling ditch, but have heard my father say that pine poles were laid in bottom and cedar brush on top and the dirt thrown on brush. On one occasion, when plowing across this ditch, the furrow horse broke through. On examination I found poles and brush all gone, of course, but there was a complete tunnel from one end to the other. The outlet was into a large run, and on one occasion, after a heavy rain, the mouth of ditch got choked up, causing it to overflow in middle of field. We promptly opened ditch and it went right on as nicely as before, and as it run from a springy place up in woods above swamp, there was quite a stream of water running through. I may add this ditch was cut through heavy clay. There is another long secret ditch on the farm adjoining this, laid in same manner as described above, which has been doing good work for nine years. Where underground ditches are cut through stony soil, or where stones are plentiful, there can be no better substitute for tiles than these. The large ones should be put

in first, then the smaller ones and brush, straw or any kind of rubbish on top. It depends very much on the nature of soil the ditch is to be cut through as to how long it will keep in good working order. If through stiff, red or pipe clay, with a good fall and outlet, it is hard telling how long even poles and brush will last. I know of one large field full of ditches where one-inch pine boards sixteen feet long and twelve inches wide were used. In main ditches three boards were nailed together, forming a square box, top plank lapping half way on two side ones, then nailed together as they were put in. In smaller ones two boards nailed V-shape, lapping half way on each other is all right. A well five feet deep and four feet square walled with one and a half inch plank near outlet of ditch is very necessary, as you will only have to keep well cleaned out and ditch will always be free.

Our contributors have mentioned most of the substitutes for tiles. We agree with them that where tiles are available, and the soil to be drained is suitable, there is no draining material to compare with the earthen tiles. But there are places in all springy land that needs drainage where tiles cannot be kept in place by reason of the crawfish. In such places we have laid a narrow board flat in the ditch to rest the tiles on or made a box of four planks till past the quicksand. I know box drains, made of six-inch pine plank which have been doing good service for over twenty years and are still good. In land where the trunks or boxes are always wet there is little danger of decay. But where there is a uniform bottom of hard clay the best underdrains are made of tiles or rocks. A rock drain, when properly made, is as good a drain as any one need wish for. Years ago in one of the oldest places in Maryland, of which we had charge, we had a spring at the foot of a lawn, which was constantly used as such for generations. One summer the water rose on the lawn above, making quite a pond on the grass. Digging down to discover the cause of this spring, we came upon a beautifully constructed stone drain which had gotten choked. The spring water was running strongly through it, and we found that what we, and generations of people before us, had been using as a spring, was really the mouth of this drain, and that the real spring was over a hundred feet away, and the drain had been made when the lawn was made a hundred years before, in order to transfer the spring water from the upper part of the lawn to the lower part. No one then living had ever dreamed of the drain. We repaired it, and though this was over twenty years ago, it is still supplying the spring. But underdrains are not always intended to carry off spring water, but to lower the general water table in the soil, and thus to provide for the water that falls in rain which would otherwise collect on the surface. The deeper the drains the wider the space they will drain, and the nearer together they are the lower they will make the water table in the soil. We have made very effective drains with three pine poles. In one piece of bottom land in Virginia, which was a sort of cove surrounded by high hills, and on which the water stood so deep in winter that ice was cut from it regularly, we cut a ditch around the base of the hills to catch the spring water, and from this took a series of ditches to a stream below. In these ditches we laid three pine poles with the bark stripped off, covered them with pine leaves and filled in the earth. The next year there was a magnificent crop of clover cut from

that land, and though the work was done about fourteen years ago, the land is still drained. This was done not because we could not have had the tiles if we wanted them, but because we wished to test the efficiency of the pole ditch. Where there is an abundance of rocks, especially of such as split flat, we would rather use them to get them out of the way than to go to the expense of getting tiles. We set the flat rocks on each side the ditch, lay flat ones over them and then put in a lot of small broken rocks and cover them with inverted sods to prevent the loose earth from washing in till the soil settles. In a good clay soil there is nothing better if the rocks are at hand. So the whole matter resolves itself into a question of local conditions. — *Practical Farmer.*

BROOM CORN.

(*Andropopgon sorghum vulgare.*)

Broom corn, as is well known, resembles sorghum in appearance, both plants being varieties of the same species. The culture of the two plants has much in common. Broom corn usually grows eight to twelve feet high, though the dwarf variety attains only half that height. The chief economic difference between broom corn and other varieties of sorghum consists in the greater length, strength, and straightness of the fine stems, composing the head, or panicle, and supporting the seeds. The longer, straighter and tougher these stems or straws, and the greener their color after curing, the higher the price the product commands. The variety, the character of the soil and season, and the thickness of planting influence these qualities.

VARIETIES.

The different varieties of broom corn afford dissimilar products. The dwarf variety produces the short brush used in the manufacture of small brooms and whisks. It is somewhat difficult to harvest and is cultivated only to a limited extent. Of the large varieties the Evergreen, known also as the Missouri or Tennessee Evergreen, has given general satisfaction. The Mohawk is regarded as earlier, but as affording a smaller yield. There is some advantage in planting more than one veriety and at several different dates so as to extend through a long season the time of harvesting. At the Colorado Experiment Station the Evergreen proved the best of six varieties tested, and was much improved by the selection of seed through several years, the brush becoming longer, stronger, straighter, and brighter. In the field from which seed was selected the inferior heads were cut away before shedding their pollen, and thus kept from crossing with more valuable heads.

CLIMATE, SOIL AND MANURING.

A climate suitable for Indian corn is also adapted to the growth of the broom corn plant. Dry weather at harvesting time is a favorable climatic condition. A well-drained, rich sandy or gravelly loam soil such as will produce a heavy yield of Indian corn, and is as free as possible from weeds, is best for broom corn. If the soil is not fertile it should be liberally manured.

Fine, thoroughly rotted barnyard manure, and other nitrogenous fertilizers may be used with advantage, preferably along the rows or drills, in order to hasten the growth of the young plants which are usually small and delicate. Plaster 250 pounds per acre and wood ashes twelve to fifteen bushels per acre have also been used on this crop with good results. In general it may be said that the system of manuring followed should be practically the same as that found adapted to corn in the same locality, and will depend largely upon the character of the soil.

PLANTING AND CULTIVATION.

The seed can be planted almost as early as corn. Only mature seed should be used, and it may be planted either in hills or drills, although drill culture is generally recommended. The rows should be three to four feet apart, and sufficient seed should be planted to insure three to five stalks every fifteen or eighteen inches in the row; or the seed may be drilled thinly so as to leave one stalk every three or four inches. An Illinois grower, however, gives eight inches as the proper distance and two quarts as the requisite amount of seed per acre by this thin seeding. Sometimes six or eight stalks are left in each hill, which are about three feet apart each way. The exact amount of seed to use depends largely upon the character of the soil and the quality of the seed.

The cultivation of broom corn is similar to that given to corn or sorghum. The early growth of the plant is slow, hence the need of prompt and frequent shallow cultivation to keep the weeds in subjection and to maintain a thin layer of loose soil on the surface.

In the culture of broom corn the value of rotation of crops is not thoroughly appreciated, and it is sometimes grown for many years in succession on the same land. If the stalks are plowed under and the seeds returned to the soil either in their green state or are fed to animals and the manure obtained applied to the soil, the draft on the soil is not very heavy. However, continuous culture, even of crops removing but small quantities of fertilizing ingredients, will eventually impoverish the soil, especially when, as is sometimes the case with broom corn, the stalks are burned on the land. Better crops will generally be secured when broom corn enters into the regular farm rotation, or when an occasional crop of clover, cowpeas, or other leguminous plant is grown on the land usually devoted to it.

HARVESTING AND CURING.

The chief difficulty encountered by the novice in broom corn culture is in determining when to harvest the brush. Even experienced growers are not unanimous on this point, some cutting the heads while in blossom, and others harvesting later so as to obtain better developed seeds possessing considerable nutritive value. The time generally preferred is just after the fall of the so called "blossom" (anthers). When the saving of more mature seed is a consideration the head may be bent down by sharply bending the stalk at a point twelve to eighteen inches below the base of the head. Thus the seeds while filling hang down and tend to keep the brush straight. This "lopping,"

if practical at all, is done after the head has attained its full length, but before the seeds acquire much weight. It is not practiced by large growers.

A common custom with tall varieties at time of harvesting is to bend down the stalks of two rows diagonally toward each other in such manner

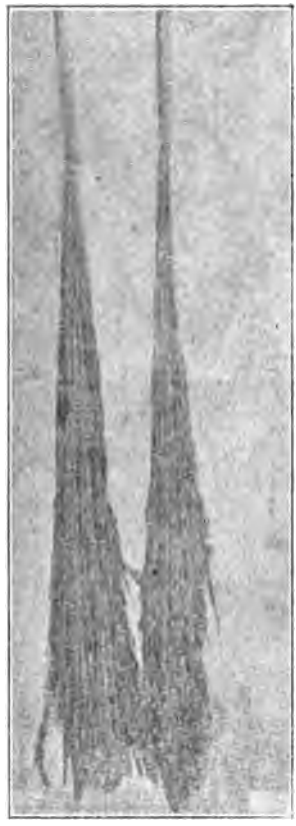
HOW TO BREAK AND CUT THE BROOM CORN.

that the bent parts support each other in a nearly horizontal position. The stalks of one row cross diagonally those of the other and form a platform, or "table." The break, or rather the sharp bend, in the stalk is made about two and half or three feet above the ground. The brush borne on one row projects over and beyond the other row in a position convenient for the cutter who follows immediately. The heads with five inches of stalk are laid on the table, or platform, until they can be removed to a drying shed. Cutting while the plants are wet with dew or rain should be avoided. The brush of the dwarf variety is pulled, not cut. If the season is dry as the corn approaches maturity the brush remains straight, but if the weather is hot and damp at this period the straws are likely to bend and to form crooked brush. In harvesting and in curing great pains are taken to keep the brush straight. Crooked or tangled brush is carefully sorted out.

From the field the brush is taken to the scrapers, which remove the seed. Large growers of broom corn employ special scraping machines, consisting of one or two cylinders provided with iron teeth and usually driven by horse power. The most complete scrapers are provided with an automatic feeding arrangement. With cheaper machines the operator holds the seed end of a handful of brush against the cylinders until the seeds are removed. It is stated that the ordinary thrashing machine, with concave removed, has been used in a similar manner. For small quantities of brush a long-toothed curry-comb, or a wooden comb made by sawing teeth in a plank has been used.

The brush should be cured in the shade, as exposure to sun or moisture

injures its color and strength. Free circulation of air is necessary in this process. Hence when large quantities are to be cured special curing houses thoroughly ventilated and provided with racks made of narrow planks and laths are constructed. On these racks layers of brush three inches thick are laid. Curing is continued until the brush will not heat when bulked, or baled.



Nat. Dep. Agri.
HIGH GRADE BRUSH.

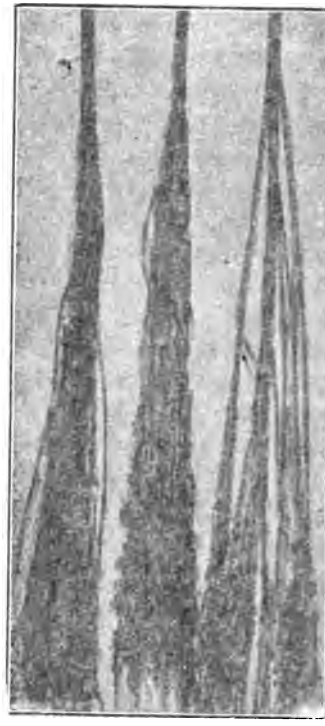
When cured, the brush is pressed into bales, usually forty-six by thirty by twenty-four inches and weighing about 300 pounds. The butts are placed evenly at the ends of the bale and the pieces of "brush" lap in the middle.

The labor of harvesting and curing makes it considerably more expensive to grow an acre of broom corn than a similar area of Indian corn. Greater skill is also required in handling the former crop.

FEEDING VALUE.

As regards feeding value the broom corn plant is inferior to Indian corn and to the nonsaccharine sorghums such as Kaffir corn, durra, millo maize.

etc., being poorer in the valuable nutritive constituents (fat and protein) and richer in indigestible fiber. The chemical composition of the ripe seed, how-



Nat. Dept. Agri.

CHEAPER GRADE BRUSH.

ever, indicate that it is but slightly inferior to corn kernels as a food. The following table shows how broom corn compares with Indian corn in this respect:

Food constituents of broom corn and Indian corn.

	Water.	Water-free material.				
		Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Broom corn plant	9 4	6.3	4.3	46.6	40.8	2.0
Corn plant	42.2	5.6	8.8	24.1	58.9	2.6
Broom corn seed	14.1	2.3	11.2	8.3	74.1	4.1
Corn kernels	10.9	1.7	11.7	2.4	78.1	6.1

Little use as a food is generally made of the broom corn fodder beyond letting the cattle run in the field after harvest. As the above table shows,

MR. A. H. LINDSAY'S 2 000-ACRE CORN FIELD IN NORFOLK COUNTY—CROP 60,000 BUSHELS—1902.

the seed, when allowed to ripen, has considerable nutritive value, but since it is necessary in securing the best grade of brushes to harvest the heads green it has been found difficult to cure the seed obtained from them. Success in preserving the green seed in air-tight silos has been reported, so that by this process a cattle food of considerable value may be economically obtained. The yield of seed varies greatly, and on the average probably approximates to the quantity afforded by sorghum grown for sirup.

EXTENSION OF THE BROOM CORN INDUSTRY.

By reason of the wide range of the broom corn plant, its culture is capable of almost indefinite expansion should the demand for brooms justify its extension. The demand for brush, however, is limited and the price subject to wide fluctuations; hence there is much risk in planting large areas of broom corn in localities where it has never before been grown. Probably the safest course for those who would extend the industry into new territory is to establish a small broom factory, and at first grow only so much brush as can be profitably made up into brooms for the local market.

A. C. TRUE, Director.

Bulletin United States Department of Agriculture.

DUST MULCH IN CORNFIELDS.

In a recent talk at an Illinois Corn Growers' Association, Mr. Mayon, Secretary of the Indiana Corn Breeders' Association, said:

"I am a believer in surface cultivation. Four inches dust mulch may be all right with you, but for us on our soil two inches is enough. I am an advocate of late cultivation. I say cultivate after harvest. I would work as though we were to have a dry season all the time. In mulching we aim to go over our fields about three times after the regular plowing. To do this, I make a board drag, drive spike nails in it, hook one horse and lead him down the rows."

PLANT CATALPA TREES ON YOUR WASTE LAND.

There are many thousands of acres of waste land in this State lying idle which could be made profitable if planted in catalpa trees. The catalpa will grow to railroad-tie size in twelve years. At least 400 can be grown upon an acre, and at 30 cents each would yield $120 per acre. The sprouts from the stumps would in five years produce good fence posts. The hardy catalpa (catalpa speciosa) is the variety to grow. Can be grown from seed or setting the young trees. Some catalpa groves in the West are producing an annual revenue of $50 per acre for fence posts, selling at 10 cents each; the posts, it is said, are more lasting than locust.

A BIG VIRGINIA CORNFIELD.

The above photo does not do justice to the corn crop on the farm where we secured this photo. Many of the shocks had fallen down and been hauled

away. There was 1,000 acres in corn on this farm this year. The owner will have something like 60,000 bushels to sell.

The variety is what is termed the "Virginia horse-tooth," from the shape of the kernel. He sells to a New York export firm who ship it all to Europe, and he gets about 7 cents per bushel more for it than he can purchase the best Western corn for.

He has figured carefully the cost of raising corn and finds it to be 20 cents per bushel when there is a yield of thirty bushels to the acre. But his yield is generally more than that. He uses no fertilizer under his corn, and after the 1st of December, he slipshucks it in the field and hauls directly to the sheller, where it is shelled, cleaned, graded, cobs crushed, shucks slit or hackled and baled, corn sacked, all at one movement from front to rear of the mill.

The corn that is grown upon the margins of the "great Dismal Swamp" is the most rank and luxuriant we have ever seen. It is a fact demonstrated over and over, again and again, that the corn grows so tall, so rank, and so dense, that in July or August one can go into the standing corn, which towers far over his head, and in the semi-darkness can clearly see the flashes of the "lightning bug" sporting in the twilight, even when the sun is shining brightly overhead at 2 o'clock P. M.

The soil is especially adapted to growing corn. In fact the earliest white settlers in Virginia, away back as 1607, were saved many a time from starving by means of corn furnished by the Indians. This seems to be in the natural corn belt of the United States, as the corn grown here is more fully matured, solid and heavy than that grown in the North or West.

A very fine crop of corn is grown here after Irish potatoes have been grown—making two staple crops in one year from the same land. Potatoes planted in February—maturing and marketed in June. Corn planted 1st July, maturing before frost in October or November. The planting season is long extending from 1st April to middle of July, while corn for the silo may be planted even later still. A. J.

HOW MANY ANGORA GOATS TO THE ACRE.

We are frequently asked the question: How many Angora goats should be kept to the acre where the object is to clean up the brush? The Maine Experiment Station has been doing some good work along this line. It began in 1901 but gave the goats too much range and they did little clearing up. In May, 1902, they put one buck, six ewes and five kids in an acre of young wood land of a mixed growth, most of the trees three to six inches in diameter, with a thick growth of underbrush. In one year they have cleaned out the small underbrush completely and the ground under the trees looks as if it had been burned over, especially where there are alders or evergreens. They have eaten the leaves and sprigs of young bushes in preference to grass; have stripped the bark from every maple, killing those six inches in diameter. They have proven very effective in cleaning up brush or evergreen wood land. One acre of good brush will furnish twelve goats all they want for one summer. We would regard this as heavy grazing, but experience proves that if you want goats to clean up brush, you must put on plenty of them, from six

to twelve per acre, according to the quantity of brush available.—*Wallace Farmer.*

TO MAKE FENCE POSTS LAST.

Fence posts for less than one cent a piece can be made to last more than twice as long as ordinary. Take boiled linseed oil and stir in pulverized charcoal to the consistency of paint, put a coat of this over the posts. This holds good on other timber exposed to the weather; few of us will live to see them rot.

JACOB FAITH.

Montivallo, Mo.

FLEMISH GIANT HARES.

As a breeder of German hares for several years, I am satisfied that, pound for pound, they can be grown more cheaply than poultry.

When about half grown, I know no flesh more palatable. Many persons in cities and towns, who do not have sufficient range for poultry, could raise a good supply of nutritious meat from a few hares.

They bear confinement to a comparatively small space, and, if permitted, will breed during the entire year. I have known parties to be successful with a piano-box for a hutch.

The Flemish Giant, one of the most recently-introduced varieties, appears to be perfectly hardy, and is very prolific. They become very large bucks, having weighed nineteen pounds. They are of a very large size as a breed, either black or steel-gray in color, without any white, and have a very prominent dewlap. Black parents will produce both black and gray progeny in the same litter, and *vice versa*. The doe will give birth to nine or more at a litter. A very profitable plan is to mate at the same time that you do the pure stock a native doe and remove her young and give her one-half of the litter of the pure doe. She will mate the day after she has littered, but the better plan is to remove the buck for about a month, producing by this method about six litters a year.

The period of gestation is thirty-one days. I have found them perfectly hardy, and the young will attain the size of the wild rabbit (hare) in two months, at which age they are most juicy and very tender. They are not at all choice in their food, eating almost all the products of the field and garden. They are fond of the parings of all vegetables, all leaves, such as cabbage, radish, beets, celery, turnips, &c. They should be given clover or other hay occasionally, and a few oats. Much corn is not beneficial. The young should not be fed upon too much succulent food, as it engenders diarrhœa. Stale bread, wheat bran, or a little corn chop should be given the young when you desire to fatten them.

A supply of pure water should always be convenient, as, contrary to a generally-conceived opinion, they drink quite frequently. Keep their quarters clean and dry, and they will always be in a healthy condition. I have recently found that they are very fond of sorghum seed, which should be fed them sparingly, without threshing it.

Many a boy or girl could add to the resources of the family larder by being encouraged to care for this valuable pet. The German and Belgian

Hares sell readily in the Philadelphia markets, and they need but to be introduced in other markets to create a demand for them.

From my personal experience, I deduce the following: Keep them from drafts of cold wind when young; provide a box sufficiently large, with but one opening, of suitable size in which the doe can litter; remove the buck from the young, as occasionally one will be found to kill them; give as great a variety of food as possible; never over-feed, especially with grain of any kind. If these suggestions are carried out, a tyro can make a success of this delightful and profitable recreation. S. B. HEIGES.

AVAILABILITY OF FERTILIZING MATERIALS.

In judging the value of a fertilizer, it is necessary to take into account not only the total amount of phosphoric acid, potash, and nitrogen which it contains, but also the proportion of these constituents which the plant is able to utilize readily. There are many substances which are very rich in one or more of the fertilizing constituents, but which hold these constituents in such insoluble forms that they are of little immediate benefit to crops. This is especially true of the feldspars, some of which contain a high percentage of potash, and of certain of the mineral phosphates, such as the Canada apatite, which contain a very large percentage of highly insoluble phosphoric acid. It is true that the fertilizing constituents of such substances, being in no danger of loss through the drainage water, gradually become available in the soil, and are thus eventually utilized by the plant. A lasting improvement of the soil is thus brought about; but with modern intensive systems of farming, in which large quantities of expensive commercial fertilizers are bought and used, the farmer very properly fertilizes for the plant and not for the soil, so long as the latter is not injured by the process; i. e., he demands an immediate return in increased crop for the money expended in fertilizers. For this reason he rightly deems it wise and economical to use available fertilizers which act vigorously upon the first crop, rather than those which very slowly become available in the soil, to be gradually withdrawn by succeeding crops. To meet this demand, the fertilizer dealers supply potash in the readily soluble Stassfurt salts, phosphoric acid in the form of dissolved South Carolina or Florida phosphate, boneblack, etc., and nitrogen in the soluble salts—nitrate of soda and sulphate of ammonia. These are standard articles, and there is no question as to their ready availability. There are, however, many other materials of lower grade which, under certain circumstances, may be used with advantage for fertilizing purposes, and in chosing from these it is of the greatest importance, as stated in the beginning, to know not only their total content of fertilizing constituents, but also the relative availability of the constituents. The natural method of arriving at this information is, of course, to submit the question to the plant in the field by means of fertilizer experiments, and this has been done time and again; but the method is time-consuming, and, even under most favorable conditions, often give uncertain results.

For this reason, students of the subject have endeavored to find some quicker and surer means of comparing the availability of fertilizer materials.

Two principal methods have been employed (often in conjunction) for this purpose: (1) Comparison of the fertilizing materials on crops grown in small pots or boxes of specially-prepared soil under well-defined or controlled conditions of moisture, temperature, etc.; and (2) determination of the solubility of the different materials in certain chemical reagents. In the latter method, the effort has been to find some chemical reagent which dissolves approximately the same amounts of the fertilizing constituents as the crop would actually utilize. As a result of such investigations, we now have a fairly satisfactory chemical method of measuring the availability of phosphoric acid in fertilizers.

The "available phosphoric acid" commonly reported in all analyses of commercial fertilizers is determined by this method, it being simply the sum of the phosphoric acid soluble in water and that dissolved by a solution of ammonium citrate of a prescribed strength under definite conditions of temperature, time of treatment, etc. Numerous experiments on crops growing in pots and in the field indicate a fairly close agreement as regards phosphoric acid in the majority of cases between the results of the chemical method and those furnished by the plant.

The question of availability does not arise in connection with the potash of fertilizers, because practically all of the potash salts used in fertilizers are soluble in water and probably equally available. As regards nitrogen, however, this question assumes the greatest importance, because this is the most expensive constituent of fertilizers and the one most easily lost from the soil (see p. 5), and because the greatest variety of substances are used as sources of nitrogen in fertilizers.

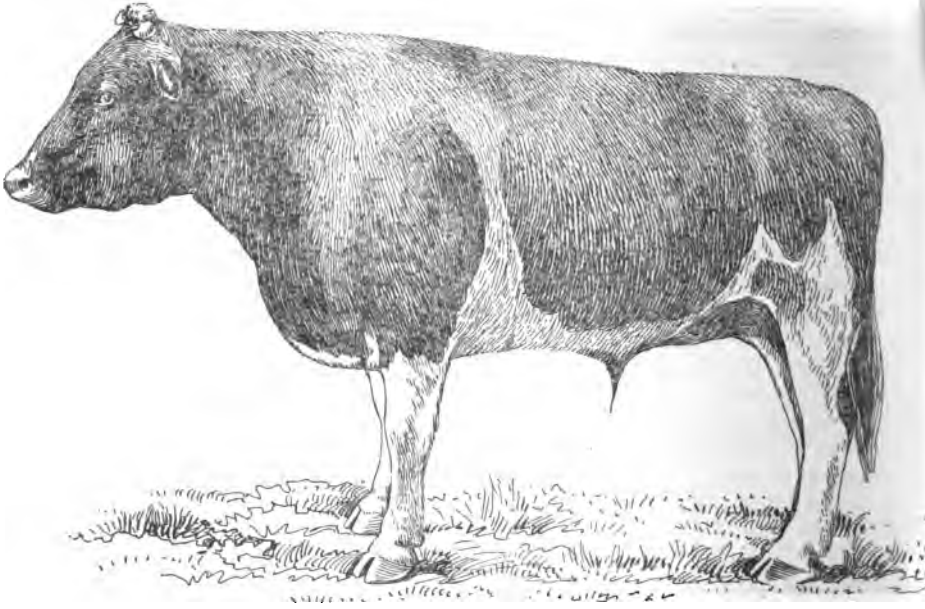
Several of the experiment stations have undertaken investigations of this subject, and the results obtained are of great practical importance.

In three-year experiments with chemical reagents and with plants growing in pots, the Connecticut State Station found the order of availability of nitrogen in certain of the more important nitrogenous fertilizers to be—(1) nitrate of soda, (2) castor pomace, (3) cotton-seed meal, (4) linseed meal, (5) dried fish, (6) dried blood, (7) horn and hoof, (8) dissolved leather, (9) tankage, (10) steamed leather, (11) roasted leather, and (12) raw leather. These results, which are generally borne out by similar experiments at the Massachusetts Station, show that, notwithstanding the fact that raw leather, for instance, contains a very high percentage of nitrogen, this nitrogen is very slowly available to the plant. When, however, the leather was treated with acid the availability of the nitrogen jumped from twelfth to eighth place. A wide variation in the availability of the nitrogen of the other materials is also shown. While the figures should not be taken as absolutely fixing the relative fertilizing value of the materials, it will be useful to bear them in mind in selecting nitrogeneous fertilizers. They may also be helpful in preparing mixtures which will furnish a continuous supply of available nitrogen to the crop throughout its growing period, which is an important consideration in many cases.—*U. S. Experiment Bulletins.*

STEER AND HEIFER BEEF.

Widely different opinions are held as to the comparative value of steer and heifer beef. American packers rate steers at from 25 to 50 cents per hundred more than heifers of the same age, breed, and general qualities. On the other hand, the opinion in England is the reverse, heifer beef being rated higher than steer beef.

For some years feeding experiments have been made at the Iowa Station to study the comparative value of steers and heifers for fattening. In the first trial, one lot of steers, one lot of spayed heifers, and one lot of open heifers were used. They were all grade Shorthorns, as nearly alike in breeding and development as possible. There were five animals in each lot. The lots were fed and treated in the same manner. Seven of the heifers calved



EXPORT STEER, wt. 1600 lbs., 3 yrs. old, fattened on grass, raised by Hon John Gwyn, Smyth co. Va

during the trial, which interfered with the comparison. The steers made a larger gain, and sold for 1 cent per pound, live weight, more than the heifers. during the whole test, which lasted about eleven months, the steers made an average gain of 806 pounds; one open heifer, clear of calf, gained 775 pounds; four open heifers, that had calves, made an average gain of 628 pounds; two spayed heifers, clear of calf, made an average gain of 736 pounds; and three spayed heifers, that had calves, averaged 645 pounds gain.

The steers were sold at 5.75 cents and the heifers at 4.75 cents per pound, live weight. Allowing 3.5 cents per pound for the steers and 2 cents for the heifers at the beginning of the trial, there was a profit of $64.39 on the steers, $30.51 on the unspayed heifers, and $13.76 on the spayed heifers. The average proportion of beef in the carcass was 63.2 per cent. for the steers, 62.4 for the unspayed heifers, and 62.8 for the spayed heifers.

When slaughtered, the carcasses were cut and judged by an expert. The heifers gave a larger percentage of prime cuts (ribs and loins) than the steers, so that, on the basis of the meat and by-products obtained, and the price paid for the steers, the heifers were worth from 0.57 to 0.62 cent a pound more than was paid for them.

Crediting each lot with the actual value of the different cuts and the by-products, and not including the expense of killing and handling, it is calculated that, at the prices which the butcher paid, he made $20.45 on the steers, $58.12 *on the unspayed heifers, and* $64.84 *on the spayed heifers.* In other words, the returns made by the heifers would have justified a purchase price of $5.37 per hundred for the spayed heifers and $5.32 for the open heifers, instead of $4.75 for each, and still have left the same profit as with the steers.

The results of a second trial to compare steers and heifers for beef production have been recently published. The test was made with 15 pure-bred or high-grade Herefords. The animals were divided into three equal lots, one of steers, one of spayed heifers, and one of open heifers, and all were fed alike during fourteen months.

The results of the experiment are briefly summarized in the following table:

Results of feeding steers and heifers for beef.

	Average Weight at end of test.	Average daily gain per head.	Dry matter eaten per pound of gain.	Average cost of feed per pound of gain.
	Pounds.	*Pounds.*	*Pounds.*	*Cents.*
Steers	1,388	1.71	8.70	4.08
Open Heifers	1,300	1.86	7.67	3 65
Spayed Heifers	1,337	1.70	8.60	4.05

As shown by the experiment, the heifers made a slightly greater average gain from correspondingly less food and at a less cost than the steers. Carefully-conducted slaughter and block tests did not reveal any material difference in the character, composition, or quality of meat from steers and heifers, although the percentage of high-priced cuts, ribs, and loins was greater in both lots of heifers than in the case of the steers.

It has been claimed that the principal cuts in heifer carcasses contain more fat than those of steers, and are, therefore, less profitable to the consumer. The average cost of the beef to the firm purchasing the cattle raised in these experiments was 6.51 cents for the steers, 6.21 cents for the spayed heifers, and 6.14 cents for the open heifers. The average selling price received by them was 6.59 cents, 6.26 cents, and 6.24 cents, respectively.

It was observed in this and other investigations that, under similar conditions, heifers are inclined to take on flesh a little more readily than steers. Larger gains by the heifers may not be shown, but there is a tendency to finish at a little earlier stage in the process of fattening. The difference between steers and heifers in this regard, when fed under the same conditions, has also been noted by practical stockmen, feeding on an extensive scale.

The fact is emphasized that heifer beef has been much underestimated, since in both trials the heifers have returned a higher net profit on the block than the steers, notwithstanding the fact that the steer beef was rated higher than the heifer beef. So far as could be learned from these experiments, spaying had no particular influence on the gains made.

PRESERVING EGGS IN WATER GLASS.

A bulletin of the North Dakota Experiment Station calls attention to the need of a simple method which will enable farmers, poultrymen, and even consumers to put away eggs during the summer months when they are plentiful and cheap, and preserve them in good condition until the winter months, when they are scarce and dear and fresh eggs cannot be obtained; and reports trials of various methods of preservation.

The spoiling of eggs is due to the entrance of air carrying germs of decomposition through the shells. Normally, the shell has a surface coating of mucilaginous matter, which prevents the entrance of these harmful organisms into the egg for a considerable time; but if this coating is removed or softened by washing or otherwise, the keeping quality of the egg is much reduced. These facts explain why the common methods of preservation have not been entirely successful, and suggest that the methods employed should be based upon the idea of protecting and rendering more effective the natural coating of the shell, so that air bearing the germs of decomposition may be completely excluded. "At the present time eggs are largely packed in lime, salt, and other products, or are put in cold storage for winter use, but such eggs are very far from being perfect when they come upon the markets." According to the experiments made by the North Dakota Station, water glass more closely conforms to the requirements of a good preservative than any of the substances commonly employed. It was found in these experiments that a 10 per cent. solution of water glass preserves eggs so effectually that "at the end of three and one-half months eggs that were preserved the first part of August still appeared to be perfectly fresh. In most packed eggs, after a little time, the yolk settles to one side, and the egg is then inferior in quality. In eggs preserved for three and one-half months in water glass the yolk retained its normal position in the egg, and in taste they were not to be distinguished from fresh, unpacked store eggs. Again, most packed eggs will not beat up well for cake-making or for frosting, while eggs from solution in water glass seemed quite equal to the average fresh eggs of the market."

Of twenty methods of preserving eggs tested in Germany, the three which proved most effective were coating the eggs with vaseline, preserving them in limewater, and preserving them in water glass. The conclusion was reached that the last is preferable, because varnishing the eggs with vaseline takes considerable time, and treating them with limewater is likely to give the eggs a disagreeable odor and taste. "There is, however, one drawback with eggs preserved in a solution of water glass, viz., that the shell easily bursts in boiling water. This may be avoided by cautiously piercing the shell with a strong needle."

The following directions for preserving by this method are given:

STRIPPING TOBACCO ON THE FARM.

Use pure water, that has been thoroughly boiled and then cooled. To each ten quarts of water add one quart of water glass. Pack the eggs in a jar and pour solution over them, covering well.

Keep the eggs in a cool, dark place. A dry, cool cellar is a good place.

If the eggs are kept in too warm a place the silicate is deposited and the eggs are not properly protected. Do not wash the eggs before packing, for by so doing you injure their keeping quality, probably by dissolving the mucilaginous coating on the outside of the shell.

For packing, use only perfectly fresh eggs, for stale eggs will not be saved and may prove harmful to the others. * * *

Water glass is a very cheap product, that can usually be produced at not to exceed 50 cents per gallon, and one gallon would make enough solution to preserve fifty dozen eggs, so that the cost of material for this method would only be about one cent per dozen. Water glass is sodium and potassium silicate, sodium silicate being usually the cheaper. If wooden kegs or barrels are to be used in which to pack the eggs, they should first be thoroughly scalded with boiling water, to sweeten and purify them.—*U. S. Experiment Bulletins.*

HOW TO MAKE SUN-CURED TOBACCO.

Select fine, sandy grey soil lying so that each row will drain itself, with orange or red subsoil (orange preferred). Light application of farm pen or stable manure with from five to six hundred pounds of some good fertilizer with at least from five to seven per cent. of sulphate of potash, should be used for best results.

Plant from 20th of May to 10th of June; when ripe, cut and then house, or scaffold, crowded together from 24 to 48 hours according to weather. Dew does not hurt it until it has yellowed, but avoid rain after the tobacco has yellowed. After it has yellowed well open out the sticks at least six inches apart so as to give plenty of sun or air, or artificial heat when housed. By using stoves (some use charcoal), but stoves are preferred, as this prevents any possible smell of gas on the tobacco. If the tobacco is very yellow, I start the fires and run them slowly all night; then if the weather is fair, open windows and doors, and let the air do the rest. If the weather is damp, then I fire again the next night, and then open to the air. I use terra cotta pipe to carry off the smoke—they are cheaper and last much longer than stove pipes.

Vigor Va N. W. WINSTON.

EVERY FARMER SHOULD TAKE ONE OR MORE AGRICULTURAL PAPERS.

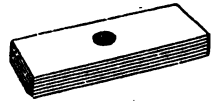
There are a number of good agricultural papers published at a low price that are worth many times their subscription price. These papers discuss during the year a great variety of subjects, which will not only interest the heads of the family, but will encourage the young members to read and inform themselves, and be a stimulus to further study and enlarged ideas. The names of a few papers are given here. Write to the editor of any of them for a sample copy:

Practical Farmer, weekly, Philadelphia, $1.00 per year; Rural New Yorker, weekly, New York, $1.00 per year; Country Gentleman, weekly, Albany, $1.00 per year; Indiana Farmer, weekly, Indianapolis, $1.00 per year; American Agriculturist, weekly, New York, $1.00 per year; Progressive Farmer, weekly, Raleigh, N. C., $1.00 per year; Tennessee Farmer, weekly, Nashville, Tenn., $1.00 per year; Hoards Dairyman, weekly, Fort Adkinson, Wis., $1.00 per year; Breeders' Gazette, weekly, Chicago, $2.00 per year; Southern Planter, monthly, Richmond, 50c. per year; The Cornucopia, monthly, Norfolk, 50c. per year; Southern Farm Journal, monthly, Baltimore, 50c. per year; Farm Journal, monthly, Philadelphia, 50c. per year.

There are a large number of other good agricultural papers too numerous to mention.

PREPARING APPLES FOR MARKET.

There are a large number of barrels and boxes of apples sent to market improperly packed that sell for 50 per cent. less money than they would bring if only a little more time and care were used in filling the barrels. Unless the apples are packed very tight, they will shake and bruise, and will never bring as much money as when packed so they will not bruise, and



bruised apples must be sold at once, as they begin to decay when exposed to the air. The cut shows two simple presses that cost but a small price, and every barrel of apples packed in this way will almost pay for the cost of either of these presses. No apples ever bring their highest value if shipped loose in any kind of a package.

SPECIAL FEEDING STUFFS ON THE MARKET.

From time to time there are special feeds and mixtures on the markets. Many claim special tonic properties, and contain a large quantity of salt, and some fenugreek or other substances of doubtful medicinal value. Below is given the analyses of some of them:

TABLE OF SPECIAL FEEDING STUFFS ON THE MARKET.

	Protein.	Carbohydrate.	Fat.
	Per Cent.	Per Cent.	Per Cent.
Pfatt's Cattle Food,.....	14.42	56.25	6.92
Climax Food,.....	12.74	53.00	3.23
Special Cow Feed,.....	13.56	61.00	6.10
Blatchford's Calf Meal,.....	25.60	52.90	4.50
Quaker Oats Feed,.....	10.00	57.92	3.86
Victor Corn and Oats Feed,.....	9.00	62.00	.97

There are many others. Some of them are wastes from the manufacture of cereal foods, or breakfast foods, and are usually inferior to corn meal or wheat brand in protein or fat, but contain a much larger per cent. of fiber.

VIRGINIA AGRICULTURE IN THE LAST CENSUS.

ITEMS OF INTEREST TO OUR VIRGINIA FARMERS, TAKEN FROM THE LAST CENSUS, 1900. THE CROPS REPORTED ARE THOSE GROWN IN 1899.

Virginia increased in the value of vegetables produced in the last ten years 491 per cent. The value of all kinds of vegetables produced in the year 1899 was $9,000,000. The value of all crops was $54,900,000. Average value per acre of vegetables, $47.63. Average value for all crops, $12.06, as compared with States like Ohio, whose average value per acre for all crops was $12.59; of vegetables, $44.97. Pennsylvania's average value per acre for all crops was $13.86; of vegetables, $51.00. Virginia ranks first in the United States as producer of kale and spinach. She ranks second in the production of cabbage.

The following counties are the largest producers of vegetables, and in canning and pickling factories:

Norfolk, 5,260 acres; Hanover, 2,906 acres; Nansemond, 2,822 acres; Princess Anne, 2,110 acres; Botetourt, 2,456 acres; Wythe, 1,037 acres; Westmoreland, 893 acres; Henrico, 814 acres; James City, 858 acres; Gloucester, 643 acres; Richmond, 705 acres; Essex, 600 acres; Northampton, 611 acres; New Kent, 437 acres; Smyth, 381 acres; Stafford, 328 acres; Isle of Wight, 298 acres; Amherst, 267 acres; Carroll, 294 acres; Roanoke, 260 acres; Middlesex, 164 acres.

COUNTIES IN VIRGINIA GROWING MORE THAN 2,000 ACRES IN IRISH POTATOES.

Northampton, 7,408 acres; Norfolk, 5,175 acres; Nansemond, 4,134 acres; Accomac, 4,067 acres; Princess Anne, 2,170 acres.

THE FIVE LARGEST SWEET POTATO PRODUCING COUNTIES IN THE STATE.

Accomac, 12,495 acres; Northampton, 3,500 acres; Hanover, 1,869 acres; Nansemond, 1,735 acres; Norfolk, 1,144 acres.

Accomac grows largely more sweet potatoes than any county in the United States. All other counties in Virginia cultivated in sweet potatoes 27,000 acres.

Certain varieties of potatoes are more liable to scab than others. Prevention or control should aim at the selection of resistant varieties, keeping the soil free from the fungus and disinfecting the seed potatoes.

It is cheaper to abandon potato growing upon badly infected soil for a time than otherwise to combat the pest. If soil is free from the fungus any method of fertilizing is safe, but if infected, alkaline fertilizers are to be avoided. Chemical disinfection of soil is not effective enough to warrant the cost.

Seed potatoes are disinfected either by soaking one and a half hours in a solution made by dissolving 1 ounce of corrosive sublimate in 7 gallons of water, or by soaking two hours in a solution made by diluting one-half pint of formalin in 15 gallons of water.

Formaldehyde gas gives considerable promise of being an effective and convenient disinfectant. Other methods of disinfection are prolonged exposure to sunlight, using sulphur in the row, and fumigating with sulphurous gas.

II. OCCURRENCE AND APPEARANCE.

Occurrence.—Scab is the commonest and most widespread disease of potatoes in America. It occurs also in Europe and probably wherever the potato is grown. The same disease attacks the roots of the various varieties of beets. A scab disease similar in appearance, and possibly identical in cause with that of potato and beet, occurs on the roots of some other garden vegetables including turnip, radish, cabbage and carrot.

The financial loss to potato growers from the scab is difficult to estimate. It often ruins a considerable portion of the crop for table use, and when it is abundant on the tuber it probably checks its growth and so reduces the yield. In one experimental field at the station farm the past year every potato was covered with scab. The only use to be made of such a crop is for stock feed or the starch factory, and in either case the value is small. The scab does not appear to affect the flavor or the cooking qualities of potatoes, but it renders them so unsightly and makes their preparation for the table so troublesome and wasteful that even a small amount of the scab on a crop seriously reduces its market value. It may also destroy the keeping quality of the tubers, scabby potatoes being especially liable to soft rot in the field and cellar.

Appearance.—Scabby potatoes are so common that a detailed description of the disease is unnecessary.

III. CAUSE.

Historical.—The cause of potato scab was a much debated question up to ten years ago. Potato growers, according to their individual experiences, attributed it to one or another condition of seed or soil, or to parasites. One man said it was due to too rich soil, another to clay, another to moisture, another to manure; many were of the opinion that it was due to wire worms, grubs, millipeds or some other form of insect life. It was often suggested that the trouble started with scabby seed, but long continued observations

at the New York and the Massachusetts experiment stations had failed to establish even this fact previous to 1890.

Scab a germ disease.—This was suggested in 1842, but it was not until 1890 that Dr. Roland Thaxter, then botanist of the Connecticut experiment station, proved that the first cause of the scab spots on potato is a fungus. If one examines the young developing scab spots on half-grown potatoes, freshly dug and still moist, the surface of each spot may be found covered with a delicate filmy white mould growth barely visible to the naked eye. It is this fungus growth eroding and irritating the potato tissues which causes the scab spot. The fungus produces vast numbers of minute spores in the course of its development. Many of these will remain in the soil of the potato field and so perpetuate the fungus, even though no potatoes are grown there for many years (see page 115). Countless numbers of dormant spores are probably carried from the field in the scab spots, and, falling from these as the spot dries out, become mingled with the dust which clings to the surface and lodges in the eyes of even the smooth tubers that have been in contact with the scabby ones in the field or the storage bins.

POTATO SCAB—DEVELOPMENT AND SPREAD.

The scab fungus, like most other fungi appears capable of very rapid development and reproduction under favoring conditions; but, on the other hand, it is very sensitive in regard to its environment. The germs may occur in abundance in the soil or on the seed potatoes, and yet lead to little scab on the crop if soil conditions do not favor; whereas, under favoring conditions, a comparatively few germs on the seed or in the soil may cause great damage. A clear understanding of the conditions governing the development of the scab is, therefore, necessary to a successful fight against it.

Presence of germs.—In the absence of the germs there can be no scab. This is settled beyond question. Eolley, of the North Dakota experiment station, states positively as a result of his experiments that neither clay, the blackest muck, nor any other germ-free soil that he tried led to scab. On the other hand, the development of scab spots was visible within from three to ten days after the germs were applied to the surface of young tubers. These germs do not originate spontaneously. The evidence indicates that the fungus is not a native to our soil. It probably was brought here along with the potatoes in the early days of their culture. Whatever the original source of the scab fungus, there is no doubt that its introduction and further spread in our fields at the present time is largely by means of contaminated seed potatoes. It may be carried occasionally on beets or other roots, or with manure, or on tools; but these agencies are probably of minor importance. Our experience in growing potatoes experimentally during four seasons on a recently cleared wood lot, where no other crop has ever been grown, has shown that in such virgin soil the scab on the crop comes from scabby seed. Trials at the New Jersey station proved that when scabby potatoes were spaded into the soil in the autumn there was a large increase in the amount of scab in the crop grown on that soil the next year. A still more important experiment, conducted at the same time, was one in which the scabby pota

The other remedial treatments may best be discussed under two heads: (1) Soil treatments; (2) Disinfection of seed.

SOIL TREATMENT.

Rotation of Crops.—When the soil has become badly infested with the scab fungus it is usually cheaper to abandon potato growing upon it for a time at least than to continue the practice. The best system of croping to purify such a soil and the length of time which should elapse before potatoes may be grown again with safety is not fully determined. The evidence indicates that root crops should be avoided, and that grains, including corn, grasses, and especially clover, are the best cleaning crops. The turning under of a green crop, like clover, just before potatoes are again planted, is especially commended for reasons cited on page 115.

Fertilizing.—In case the soil is free from the scab fungus and clean seed is used any method of fertilizing is safe. The only exception may be that of stable manure from animals fed on scabby potatoes, but the experiment referred to on page 115 indicates, but does not prove, that manure from cattle fed on scabby potatoes may be used with safety.

In case the germs are already present in the soil, or on seed potatoes, stable manure and certain alkaline fertilizing substances which favor the development of the fungus are to be avoided. These substances include ashes, lime (either quick or air-slaked), soda-ash (carbonates of soda), potash (carbonate of potassium) and magnesia. On the other hand, certain fertilizing elements which are not favorable to the fungus are to be commended. These include land-plaster (sulphate of lime), common salt, nitrate of soda, kainit, muriate of potash, sulphate of potash, sulphate of ammonia, superphosphates and most commercial fertilizers. Instead of stable manure applied directly to the potato crop, clover should be grown and the potatoes planted on the clover sod. There would probably be even less objection to the use of the stable manure on some crop like corn, which preceded the clover.

The Use of Sulphur and Other Chemical Disinfectants.—Many chemical disinfectants have been tried on contaminated soil in the hope that the soil might be purified by this method. These trials have included direct applications to the soil in varying amounts of Bordeaux mixture, corrosive sublimate, formalin, potassium sulphide, carbolic acid, copper sulphate and sulphuric acid, but in none of these cases has there been appreciable benefit. The one chemical which has proved promising for use in this way is flowers of sulphur. Experiments at the New Jersey station have led Halsted to believe that an application in the drill at planting time of three hundred pounds of sulphur to the acre will check the scab even in an infected soil. Others trying this same method have had varying results. At the Rhode Island station even six hundred pounds of sulphur to the acre was found to be practically useless. Last summer at this station sulphur was applied in a drill at the rate of four hundred and seventy-five pounds to the acre on soil that was known to be badly contaminated. Moreover, disinfected seed was used, yet the result was a crop in which *every potato was badly scabbed.* We are convinced, therefore, that flowers of sulphur is at best an unreliable

remedy and not to be recommended. It's excessive cost—ten dollars or more to the acre—practically prohibits its use.

DISINFECTING SEED POTATOES.

Where the soil is free from the fungus the practical remedy for the scab is the disinfection of the seed tubers. The object is to kill the germs clinging to the tubers without injuring the tuber itself. This can be done more or less successfully in different ways. Soaking the seed tubers in a solution either of corrosive sublimate, or of formalin is a method now used by many practical potato growers. Other remedies have been discovered, the value of which has not been so thoroughly demonstrated, but which may prove preferable, at least in some cases.

Corrosive Sublimate Treatment.—Corrosive sublimate, or bichloride of mercury is a white crystalline substance, resembling salt, which can be bought from any druggist. To make the solution place one ounce of this chemical in one gallon of hot water, and after allowing it to stand ten or twelve hours until dissolved, dilute with more water to make seven gallons. This solution should be made in wooden or earthen, rather than metal, dishes, since it corrodes metals. The seed potatoes are to be soaked one and one-half hours in the solution. The disinfection may be done at any convenient time previous to planting. In fact, after experimental use of this solution for several years we are led to recommend that the disinfection be done several weeks before planting, since it may retard germination somewhat when used just before planting.

In using this solution it must be remembered that it is *deadly poisonous to men and animals if taken internally.* It is not poisonous to the skin, however, so that one may handle the solution or the treated seed with impunity. All tubers soaked in it should be planted, buried or burned.

Corrosive sublimate costs 15 cents an ounce. Since the same solution can be used over and over again indefinitely, the expense for disinfection other than labor is but a trifle. The chief disadvantages in the use of corrosive sublimate, as compared with the next remedy, formalin, are two-fold: First, its poisonous nature; and, second, the difficulty of dissolving it.

Formalin Solution.—Formalin is a watery liquid, also known to the trade as formaldehyde solution. It is used with potatoes, at the rate of eight ounces (one-half pint) of the commercial formalin to fifteen gallons of water. The seed potatoes are soaked two hours in the solution. If this method is used it is better, according to our experiments, to disinfect the seed not more than a few days before planting. Corrosive sublimate and formalin have in our comparative trials during the last three years given equally good results as remedies for the scab. The chief advantages of formalin are that it is not poisonous, and, being a liquid, it is easily diluted for use, and may be placed in any kind of receptacle. It is, therefore, considerably more convenient than is the corrosive sublimate. Another fact in favor of the formalin is that it does not injure the seed tubers or retard their germination as does the corrosive sublimate in some cases. Formalin costs from forty to fifty cents a pound (pint). It is, therefore, a little more

This objection has been overcome in part by the use of trays and racks. At the Rhode Island Station the rack used held nine trays. Each tray was 3¾ feet long and 1½ feet wide, and would hold about one bushel of potatoes when spread out in a single layer for sprouting. The bottoms of the trays were made of pieces of lath placed about one inch apart. Nine trays were placed in a rack over each other, leaving about nine inches of space between each tray.

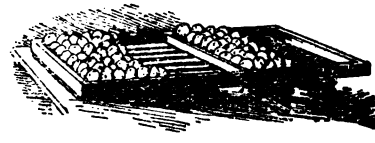


FIG. 2—Tray partially filled with potatoes for sprouting.

This method of arrangement has the advantage of securing a very uniform distribution of light, heat, and air for all the trays. It greatly facilitates the handling of the potatoes and lessens the danger of breaking off the sprouts when transferring to the field for planting. The illustrations (figs. 1 and 2) show the construction of the trays and rack used at the Rhode Island Station and the position of the potatoes in the trays.

Another method of securing early potatoes in Rhode Island on a commercial scale is that of sprouting tubers in a cold-frame and planting out as soon as danger of frost is past. The tubers are cut into pieces, not smaller than an English walnut, after rejecting the two or three eyes nearest the stem end, which have been found to start late. The pieces are placed side by side in the bed, skin side upward, and covered about four inches deep with fine, rich earth. Their growth can be controlled by proper regulation of the cold-frame sash. At planting time the tubers, the sprouts of which should be just breaking the surface of the soil, are carefully lifted with manure forks, separated by hand, and placed in well-fertilized rows, and entirely covered with soil; or, if danger of frost is past, they are placed with the apex of the sprout just at the surface of the soil. About 216 square feet of cold-frame is required to sprout sufficient potatoes to plant an acre in 30 to 32 inch rows, 12 inches apart. Eight men can transplant an acre in a day.

On the Island of Jersey, where early potatoes are raised in large quantities for the London market, the potatoes destined for seed are placed side by side in shallow boxes and stored, as soon as cold weather sets in, in a light and well-sheltered loft or shed, out of danger of frost. The position of the boxes is changed from time to time so that the sprouts will be of equal length and strength at the planting season. A typical sprout averages about one half inch in length. Medium-sized tubers selected from the best of the crop and allowed to lie in the field in the fall until they become greenish are used.

Potatoes for early use are sometimes started in pots in the greenhouse and then planted out as soon as danger of frost is over. The cost incident to this method limits its use, except for family supply.—C. B. SMITH, in U. S. Report.

SEEDING GRASS LAND WITHOUT A NURSE CROP.

The practice of sowing grass and clover seed with crops of grain is a very common one and undoubtedly has many advantages on rich soils and in favorable season, the most marked of which is the choking out of weeds by the vigorous growth of the grain. In many cases, however, this method fails. Especially is this true in dry seasons when the supply of moisture is frequently insufficient for both the grain crop and the grass. In this case the grain, instead of acting as a nurse crop, actually robs the young grass plants of moisture, and thus becomes injurious instead of advantageous.

The claim that grass and clover plants need protection from the sun is entirely without foundation. As the Wisconsin Station has shown, "there is absolutely no necessity, under ordinary conditions, for sowing oats, barley, or any other grain with grasses for the purpose of yielding shade and protection. Young grass and clover plants are not injured by direct sunlight and sun heat any more than other plants of our fields."

Experiments by the Wisconsin Station during a number of years have shown that "grasses and clover sown by themselves on properly-prepared soil spring up at once and make rapid growth, bearing seed heads the same year. If all conditions as to fertility of soil, moisture, etc., are favorable, a very excellent crop of hay can be secured the same season." One objection to this method of seeding grasses is the presence of weeds, but these can usually be checked by running a mower over the fields when the weeds are six or more inches high, setting the cutter bar so that the tops of the weeds are removed while the grass plants are not touched.

In order that this method of culture may be successful the soil must be quite free from weed seeds and of fair fertility. It should be carefully prepared before seeding and from two to three times the usual amount of grass seed should be sown. It is probably best, although not fully demonstrated, to sow seed very early in the spring. Finally, it is of the greatest importance to check the growth of weeds, which may be done by the method noted above.

"The system here under consideration is not put forth as suited to every farm and all farmers, but eminently adapted to meeting the wants of those who desire to secure with the least possibility of failure a fine stand of grass and clover. To such we can recommend the system as having been sufficiently tried to prove satisfactory when properly followed out."

The results obtained by the Wisconsin Station have in general been borne out by those of similar experiments at the New Jersey Station. The experiments by this station however, differed from those conducted by the Wisconsin Station in the fact that at the former the seed was sown in the fall instead of in the spring.—U. S. Experiment Reports.

DIVERSIFIED FARMING AND MARKETING.

Farmers in some sections of the State are diversifying their crops more than in former years with much profit. Reports have been received where from $50 to $100 per acre net profit were realized last year and this year from growing strawberries. A diversity of crops, suitable to the soil and markets,

will increase the profits from the farm. A few acres in some of the berries, or fruits, or high-class vegetables, nicely prepared for market, will increase the revenue from the farm.

There is no crop that will produce greater results under good management and favorable conditions like celery. Last year a grower of celery sold from his fraction of an acre lot of celery at the rate of over $10,000 per acre. Not every farmer can grow celery, but there are other high-class products that will prove profitable in many localities. The soil, climate and markets accessible to the grower should always be considered before deciding on what to grow. Some farmers can grow certain crops at a profit, while others cannot. One may have the soil and market facilities, the other may not..

It is a matter of great importance that more attention be given by our farmers generally to the manner in which their products are put upon the market—especially fruits and many kinds of vegetables. The selling price will be governed very much by the attractive appearance given the product in packing and shipping to market. Berries and delicate fruits should be put in small packages. These are sometimes sent to market in boxes too large. The lower half of the contents of these boxes are badly bruised and mashed, and lose fifty per cent. of their value. Apples are frequently shipped in barrels loosely packed, and arrive at their destination bruised, and sell for much less than they would bring if properly packed by a press. It requires six months to grow some of these products, and it pays well to spend a little more time in properly preparing them for market. The entire profit is often lost in this way. It pays also to have every package or barrel to run the same from top to bottom.

A WORD OF CAUTION ABOUT FERTILIZERS.

Farmers are requested not to receive any fertilizer that is offered for sale in violation of the fertilizer law. Do not receive any bags that are not tagged or branded.

Some bags have been found to be short in weight from five to twenty pounds. Reports have been made also of bags containing a different fertilizer in the bottom of the bags from that on the top. Buy your fertilizers in this State. It does not matter where the fertilizer is made, but buy it in this State, so as to be protected by the law.

G. W. KOINER, *Commissioner.*

BULLETIN No. 1.

STATE TEST FARM,

LOCATED AT

Saxe, Charlotte Co., Va.,

UNDER THE CONTROL OF THE

STATE BOARD OF AGRICULTURE.

Prof. S. B. HEIGES,

Manager.

Hon. G. W. KOINER, *Commissioner of Agriculture of Virginia*:

Sir:—I have the honor to report upon the experiments conducted, and the general farm work of the Virginia Test farm from July, 1901, till November, 1902.

Yours truly,

Sylvan Hill, November 15, 1902.

S. B. HEIGES, Manager.

MANAGER'S RESIDENCE, BUILT ON STATE TEST FARM IN CHARLOTTE COUNTY BY THE BOARD OF AGRICULTURE.

REPORT OF PROF. S. B. HEIGES, MANAGER OF TEST FARM.

Through the liberality of the citizens of Charlotte county, Virginia, the Department of Agriculture was donated a farm, near Saxe, to be used for the purpose of testing fertilizers, cereals, grasses, tobacco, vegetables and fruits, and conducting and reporting upon all such experiments as might prove interesting and profitable to general agriculture and horticulture.

The farm consists of 500 acres, about one-half being cleared, the remainder being woodland.

It is a portion of the estate long known as Sylvan Hill, and was at one time regarded as the "garden spot of Charlotte county."

The Board of Agriculture selected me to take charge of the work, connected with that of the Department of Agriculture, of which I assumed charge July, 1901. By the terms of purchase I found a farm from which the hay, straw and manure had been removed by the former owners. There were no farming implements with which to begin operations, and my first work was to whitewash barn and all outbuildings.

By the time teams and implements were procured it had become too late to put out any crops for roughage that would have matured sufficiently to safely cure them. I turned my attention to making hay of crab grass, wire grass and broom sedge before it had blossomed.

Of these we secured 64 two-horse loads of palatable and fairly nutritious hay, and 46 loads for bedding.

The first work of a scientific and experimental character was done September 5th by seeding one and two-thirds acres to Crimson clover.

After thoroughly preparing the ground by plowing, rolling and pulverizing with Cutaway disk and smoothing harrows, 210 pounds per acre of a complete fertilizer, consisting of 12 per cent. available phosphoric acid, 3 per cent. nitrogen and 3 per cent. potash were applied by the drill, together with 15 pounds Crimson clover seed per acre.

STRAWBERRIES.

In order to test quality, productiveness and adaptability to soils of this section of the State, a plat of ground was thoroughly prepared by plowing, rolling and harrowing, using 100 pounds bone-black, 100 pounds nitrate of soda per acre.

One hundred plants each of the following varieties: Aroma, A. A. P., Brandywine, Brunette, Clyde, Cumberland, Excelsior, Edith, Gandy, Glen Mary, Hoffman, Howell, Jesse, Lady Thompson, Maximus, Nick Ohmer, Ridgeway, Sample, Seaford, Sharpless and Tennessee Prolific were planted

in rows four feet apart with plants two feet distant in the rows. These plants were set out October 4 and 5, 1901. The Ella, a very early variety, was planted about two weeks later.

The plants were cultivated several times during the fall, and after the ground was thoroughly frozen were covered with hay. The fall was unusually dry, forty days intervening from time of planting until we had the first rain.

In order to save the plants, they were watered daily in the meantime.

In the spring of 1902 they were worked several times prior to blossoming, to destroy all weeds.

Some of the varieties produced about one-half a crop, the Ella being the earliest by at least eight days, and the Gandy being the latest.

We propose to weigh the fruit of each variety next season and report upon productiveness, quality, hardiness and plant production.

No variety, as yet, has shown any tendency to rust or leaf-blight.

The plants were dressed before last working with nitrate of soda at the rate of 50 pounds per acre, about ten days before blossoming. They are at present time equal to any that I have ever seen in the most noted strawberry sections of the United States.

EXPERIMENTS WITH OATS.

After deeply plowing and thoroughly pulverizing the soil with corrugated roller, cut a-way disk harrow and smoothing harrow we seeded the following plats with winter turf oats, beginning September 9, 1901, and finishing October 3d, in order that we might learn the advantages of comparatively early and later seedings. Plat 1 was only plowed. Owing to the conformation of the land, these plats could not be made of equal size, as the fertilizers in solution would have been carried from one plat to another.

Plat 1, containing five-twelfths of an acre, after drilling in at the rate of 210 pounds per acre of a 3, 12 and 3 per cent. (3 per cent. ammonia, 12 phosphoric acid and 3 potash) fertilizer, was seeded broadcast upon the rough ground in order to learn if such method would prevent "freezing out." Seeded September 9th.

Plat 2 was prepared as described, had an application of 420 pounds per acre of same fertilizer. Seeded September 10th—five-twelfths acre.

Plat 3, prepared as described, had an application of the same fertilizer at the rate of 210 pounds per acre. Seeded September 10th—five-twelfths acre.

Plat 4, rolled, harrowed with cut-a-way harrow, had no fertilizer, and was finished with the drag (a sled with a solid plank bottom). Seeded September 10th—eight-twelfths acre.

Plat 5, land prepared as described, had an application of 150 pounds muriate of potash per acre, and was finished with the smoothing harrow. One acre.

Plat 6, land similarly prepared as other plats excepting No. 1, had an application of 150 pounds dried blood per acre. Area, one acre. Seeded September 10th.

Plat 7, soil cultivated in same manner as plat 6, was treated to 75 pounds

WINTER OATS FIELD ON TEST FARM—YIELD FORTY BUSHELS PER ACRE—YEAR 1902.

dried blood and 75 pounds muriate of potash per acre. Area, one acre. Seeded September 10th.

Plat 8, soil similarly prepared as above described, had an application of 150 pounds bone-black per acre. Area, one acre. Seeded September 10th.

Plat 9, land similarly prepared, had 210 pounds complete fertilizer per acre, with 2¼ bushels oats per acre, drilled September 30th. Area, four and one-sixth acres.

Plat 10, on land similarly prepared, 210 pounds complete fertilizer per acre, with 2 bushels oats, 12 pounds clover seed and 4 pounds timothy seed, were drilled in October 3d. Area, four and one-sixth acres.

DEDUCTIONS.

All of the plats, excepting No. 9, were seeded at the rate of 2 bushels of oats per acre.

There was no apparent advantage from the heavier seeding during the fall, the following spring or at time of harvesting.

Plat 1, seeded on rough ground, and *afterwards* thoroughly harrowed, did not stand the winter any better than the plats thoroughly cultivated *before* seeding.

Plat 4. This plat, devoid of any fertilizer, did not produce more than one-half crop, compared with the remaining plats.

Plat 5, fertilized with 150 pounds of muriate of potash per acre, produced the best crop, the crop being heavier and more fully developed in grain.

We had hoped to be able to collect each plat separately, weigh grain and straw of each, and embrace the results in our first bulletin.

As yet we have not been provided with hay scales, and we were obliged to abandon that part of our experiment.

There being no granaries on the farm, in which grain can be kept from the rats, we threshed only what would be needed for seed this fall and next spring, intending to feed the rest in the sheaf. From the portion threshed, the estimated yield per acre was about 35 bushels.

HAY MIXTURE AND PERMANENT PASTURE.

Three-tenths of an acre were put in thorough tilth for a mixture of grasses for hay. 250 pounds complete fertilizer per acre were applied broadcast, and the following varieties and quantities were sown broadcast and covered with a smoothing harrow: Orchard grass, 18 pounds; Meadow fescue, 9 pounds; Fancy Red Top, 13 pounds; Red clover, 4 pounds.

An equal area was prepared and fertilized in similar manner, and seeded for permanent pasture with the following grasses: Red clover, 2 pounds; Orchard grass, 2 pounds; Fall fescue, 3 pounds; Canadian Blue grass, 2 pounds; Red Top, 3 pounds; Perennial Rye grass, 8 pounds, and Herd grass, 13 pounds, seeded and covered as above. Although the fall was excessively dry, the fine condition of the soil enabled the seed to germinate readily, and before winter began the ground was completely covered with the grasses of both plats.

During the following spring we made an application of nitrate of soda

to a portion of each plat, and, when the grasses were matured, cut these portions separately and weighed the hay when thoroughly dried.

On the portion of the hay mixture plat where no soda was applied the hay produced was at the rate of 1,960 pounds per acre; on the portion treated with nitrate of soda, at the rate of 100 pounds per acre, the hay weighed at the rate of 2,178 pounds per acre, a gain of only 11 per cent. On the portion of the permanent pasture plat, where no soda was applied, the hay weighed at the rate of 2,396 pounds per acre, and where the soda was applied the hay was at the rate of 4,574 pounds per acre, a gain of 91 per cent.

DEDUCTIONS.

The comparatively slight increase in the hay mixture where fertilized resulted from some of the grasses being almost mature when the soda was applied, whilst in the permanent pasture the grasses were of such a character that they grew during the entire season.

In order that nitrate of soda may produce the best results on grasses for hay, it should be applied early in the season.

At present writing the effects of the soda are strikingly apparent, the grass being about twice as high as that to which it was not applied, and the hay mixture shows the greater increase of growth.

Prior to seeding wheat, additional plats of Crimson clover were put out in order to discover, if possible, the best method.

To plat No. 2 250 pounds complete fertilizer per acre were applied and seeded at the rate of 22½ pounds per acre immediately after plowing, cultivating thoroughly before seeding. Area, two-thirds acre. Seeded September 20th.

To plat No. 3, 250 pounds complete fertilizer per acre were applied, seeded broadcast and harrowed immediately after plowing. Area, two-thirds acre. September 20th.

To plat No. 4, 250 pounds complete fertilizer per acre were applied, seeded as soon as plowed and harrowed, at the rate of 22½ pounds per acre, and covered withthe drag. Area, 1½ acres. September 30th.

The four plats germinated finely, and before winter the ground was heavily covered with young clover, but the absence of snow during the winter and the frequent freezing and thawing, lifted many of the young plants entirely out of the ground.

Where, as an experiment, we had seeded the Crimson clover with the winter oats we had a splendid stand the next summer.

DEDUCTIONS.

Crimson clover should either be seeded earlier, if the ground can be put in proper condition, or should be seeded with some crop that will give it winter protection.

WHEAT EXPERIMENTS.

During the fall of '01 we conducted two series of experiments in wheat culture—one on the field plan and the other on the plat plan.

Culler's Prolific was seeded on land thoroughly fined by roller and harrows

WHEAT FIELD ON TEST FARM—YIELD TWENTY BUSHELS PER ACRE—YEAR 1902.

at the rate of 7 pecks per acre, drilled with 250 pounds fertilizer per acre. Seeded October 5th. Area, 2 acres.

Culler's Prolific was seeded at the rate of 7 pecks per acre, with 250 pounds complete fertilizer per acre, and was rolled and harrowed after seeding. Seeded October 10th and 11th. Area, seven and one-twelfth acres.

This portion of the field came up more readily and uniformly than any other portion of the entire field.

We did not have sufficient rain to lay the dust from October 4th till November 12th, a period of almost forty days, and the later seeded portions of the field germinated very poorly.

On examination in the spring we found at least 25 per cent. of the seed had not germinated. The compacting of the seed by the roller no doubt caused the better germination.

Gold Coin was seeded at the rate of 7 pecks per acre upon land fertilized with 210 pounds complete fertilizer—clover on part, timothy on all—October 14th and 15th. Area, 15¼ acres.

Gold Coin was seeded on land fertilized with 70 pounds of dried blood and 140 pounds acid phosphate per acre, in three lands, at the rate of 5 pks., 6 pks. and 7 pks. per acre, to test proper quantity of seed, October 16th. Area, 4½ acres.

Owing to the unfavorable season for germination, the heaviest seeding presented the best appearance in the fall, and produced the best results at harvest.

Had all the seed germinated the results might have been different.

Gold Coin was seeded on land fertilized with 210 pounds slag phosphate, at the rate of 5 pks. per acre, October 16th. Area, one and five-twelfths acres.

Culler's Prolific, at the rate of 6 pks. per acre, was seeded on land fertilized with 70 pounds blood and 140 pounds slag phosphate, October 17th. Area, two and two-thirds acres.

DEDUCTIONS.

The Gold Coin and Culler's Prolific, grown on portions fertilized with slag phosphate, and slag phosphate and blood were the best of all our field experiments, the yield averaging 20 bushels per acre. It must be stated, however, that this is recognized as the most fertile portion of all the uplands of the farm, and all credit should not be given to the fertilizers.

The land varied in productiveness from 2 to 20 bushels per acre.

What is known as the "Middle Hill" did not produce, on an average, more than 2 bushels per acre, and in portions did not produce the amount sown as seed.

We propose to adopt a plan by which, when sufficiently fertile, this hill shall be put into permanent grass, as no system of crop rotation can prove profitable on lands of such a character.

EXPERIMENTAL WHEAT PLATS.

As these plats are to constitute a continued series of experiments, rotating with other crops, we deem it necessary to explain the symbols adopted to rep-

resent the various fertilizers used. They are not the symbols of chemistry, but are more easily placed upon the legend that shall be put up to each plat.

P. Represents Phosphoric Acid..... 4.8 lbs.
N. (Nitrogen), represents Ammonia..... 1.2 lbs.
K. (Potash), represents Potash..... 1.2 lbs.
L. Lime.
M. Farm manure.

Normal application, 400 lbs. per acre of fertilizer.

Containing. Phosphoric Acid..... 12%, giving per acre 48 lbs.
Ammonia ..... 3%, giving per acre 12 lbs.
Potash ..... 3%, giving per acre 12 lbs.

Which, therefore, will give, on a 10th of an acre:

Phosphoric Acid ..... 4.8 lbs. equal P.
Ammonia ..... 1.2 lbs. equal N.
Potash ..... 1.2 lbs. equal K.

P. equals:

30 lbs. 16% Acid Phosphate.
26 2-3 lbs. 16% Thomas Slag.
24 lbs. 20% Bone.
40 lbs. 12% Phosphate Rock.

N. equals:

7.06 lbs. 17% Dried Blood.
4.8 lbs. 25% Ammonium Sulphate.
6.3 lbs. 19% Sodium nitrate.
30. lbs. 4% Bone.

K. equals:

2.4 lbs. 50% Sulphate of Potash.
2.4 lbs. 50% Muriate of Potash.
10. lbs. 12% Kainit.

APPLICATION FOR EACH PLAT.

No. 1 of P., 30 lbs. Acid Phosphate.
No. 2 of P., 30 lbs. dissolved Bone Black.
No. 3 of P., 26 2-3 lbs. Thomas Slag.
No. 4 of P., 40 lbs. Phosphate Rock.
No. 5 of N., 7 lbs. Dried Blood.
No. 6 of N., 4.8 lbs. Ammonium Sulphate.
No. 7 of N., 6.3 lbs. Sodium Nitrate.
No. 8 of K., 2.4 lbs. Muriate Potash.

N. B.—Each one of these plats contained only one fertilizer—4 having P., 3 having N. and one having K.

No. 9, Blank.
No. 10 P. N., 30 lbs. Acid Phosphate and 7 lbs. Blood.
No. 11 P. N., 24 lbs. Bone.
No. 12 P. N., 24 lbs. Bone and 1.4 lbs. Blood.
No. 13 P. K., 30 lbs. Acid Phosphate and 2.4 lbs. Muriate Potash.

No. 14 N. K., 7 lbs. Blood and 2.4 lbs. Muriate Potash.

Each one of these plats contained two fertilizers, 3 having P. and N., one having P. and K. and one having N. and K.

No. 15 P. N. K., 30 lbs. Acid Phosphate, 7 lbs Blood and 2.4 lbs. Muriate of Potash.

No. 16 P. N. K., 30 lbs. Acid Phosphate, 5 lbs. Blood, 6.3 lbs. Sodium Nitrate and 2.4 lbs. Muriate Potash.

No. 17 P. N. K., 30 lbs. Acid Phosphate, 4.8 lbs. Ammonium Sulphate, 2.4 lbs. Muriate Potash.

No. 18 P. N. K., 26 2-3 lbs. Thomas Slag, 7 lbs. Blood, 2.4 lbs. Muriate Potash.

Nos. 19 P. N. K., 40 lbs. Phosphate Rock, 7 Blood, 2.4 lbs. Muriate Potash.

Each one of these plats contain three fertilizers, P. N. and K.

20, Blank.

21 P.½ N. K., 15 lbs. Acid Phosphate, 7 lbs. Blood, 2.4 lbs. Muriate Potash.

22 P. N.½ K., 30 lbs. Acid Phosphate, 3.5 lbs. Blood, 2.4 lbs. Muriate Potash.

23 P. N. K.½, 30 lbs. Acid Phosphate, 7 lbs. Blood, 1.2 lbs. Muriate Potash.

These plats contain ½ the quantity of one fertilizer each. (A numeral or a fraction after a symbol affects only what is before it.)

No. 24, 200 lbs. Cayuga Plaster.

No. 25, P^2. N. K., 60 lbs. Acid Phosphate, 7 lbs. Blood and 2.4 lbs. Muriate Potash.

No. 26, P^2. N. K., 30 lbs. Acid Phosphate, 40 lbs. Phosphate Rock, 7 lbs. Blood, 2.4 lbs. Muriate Potash.

No. 27, P. N^2. K., 30 lbs. Acid Phosphate, 14 lbs. Blood, 2.4 lbs. Muriate Potash.

No. 28, P. N^2. K., 30 lbs. Acid Phosphate, 7 lbs. Blood, 2.4 lbs. Sulfate of Potash. In March apply 6.3 lbs. Nitrate Soda.

No. 29, P. N. K^2., 30 lbs. Acid Phosphate, 7 lbs. Blood, 4.8 Muriate Potash.

Each of these plats had one fertilizer doubled.

No. 30, 2 (P. N. K.), 60 lbs. Acid Phosphate, 14 lbs. Blood, 4.8 lbs. Muriate Potash.

This plat had each fertilizer doubled. (A numeral before the parenthesis affects each symbol in it.)

No. 31, Blank.

No. 32, 1,600 lbs. Stable Manure.

No. 33, 3,200 lbs. Stable Manure.

No. 34, 400 lbs. Lime.

No. 35, P. N. K. L., 30 lbs. Acid Phosphate, 7 lbs. Blood, 2.4 lbs. Muriate Potash and 400 lbs. Lime.

No. 36, Blank.

These 36 plats of 1-10 acre each were seeded on well prepared land October 21st to 24th, with Culler's Prolific Wheat, 9 lbs. to each plat or 1½ bushels per acre. Our object being to learn which of the three component parts of a complete fertilizer would produce the best results or whether two or three were needed. And, as some varieties of wheat are more productive than

others, we were obliged to use the same variety on each plat. The fall was very dry and much of the wheat never germinated.

The experiments were not as conclusive as they should have been, but the stable manure and the plats containing N. and K. were uniformly the best.

As we had no means of weighing the straw our estimate is based upon frequent visitations to the wheat when standing and afterwards comparing the shocks on the several plats.

VARIETY TEST.

On well prepared land fertilized with Dissolved Bone Black, Dried Blood and Muriate Potash in equal quantities at the rate of 90 lbs. per acre, on plats of 1-10 acre each, we tested quite a number of varieties of wheat. The fertilizer being the same on each plat, other conditions being equal a different yield must result from the productiveness of the variety. These plats were seeded October 25th at the rate of 1½ bushels per acre.

The varieties were threshed separately and yield carefully measured.

The greatest yield is represented by 100 and the other varieties compared with that. The comparative yields are placed after the variety.

We have seeded this fall the entire yield of four of the most productive varieties, so that we may have seed to distribute next fall to farmers who may desire to test one or more.

The same climatic conditions affected these plats and much of the seed never germinated. The stand was thin but the heads were remarkably fine and well filled.

VARIETIES.

No. 1, Rural New Yorker No. 57, yield..... .90
No. 2, Dawson's Golden Chaff, yield..... .75
No. 3, Rochester Red, yield..... .75
No. 4, Reliable, yield ..... .95
No. 5, Harvest King, yield..... .90
No. 6, Gold Coin, yield ..... .90
No. 7, Eclipse, yield 100
No. 8, Fulzo Mediterranean, yield ..... .95
No. 9, Royal Red Clanson, yield..... .98
No. 10, Ontario Wonder, yield..... .85
No. 11, Beechwood Hybrid, yield..... .98
No. 12, Rural New Yorker No. 6, yield..... .98
No. 13, Harvest Queen, yield..... .80
No. 14, Ohio Beauty, yield..... .90
No. 14½, Russian Red, yield..... .90
No. 15, Buda Pesth, yield..... .90
No. 16, Valley, yield ..... .90
No. 17, Rudy, yield ..... .90
No. 18, Yellow Gypsy, yield..... .90
No. 19, Sibley's New Golden, yield..... .98
No. 20, Improved Poole, yield..... .90

DEDUCTIONS.

Some of the varieties produced so poor a yield that, had the season been more favorable, we would have discarded them from our varietal tests.

Culler's Prolific shatters more badly than any other variety of wheat that we have ever tested and, although productive, cannot be recommended for general culture. Gold Coin fails to fill the upper meshes of the heads with full, plump kernels, and is not as productive as one would suppose from the stand of wheat. This was true of this variety on all the plats to which different fertilizers were applied. It appears to be an inherent weakness of the variety.

Improved Poole, Russian Red and Harvest King, from careful study, appear to be identical. In node, length and width of blade, shape of head, arrangement of meshes and color of straw, chaff and kernel they resemble each other. We propose to test them again another season. A single season should not be taken as the basis of results, especially one so unfavorable for wheat culture as the last one.

Another year's experience may reverse the results of the present crop. A series of experiments extending through a number of years with different climatic conditions will be required.

TEST OF VEGETABLES.

All of the garden vegetables grown for culinary purposes were grown during the season of 1902. Good results were obtained with all but carrots and parsnips, the dry weather interfering with their germination and the crab grass smothered what few started.

The following named varieties proved of excellent quality and were exceedingly productive: Hanson, Iceberg and Silver Anniversary Lettuce, Columbian, Stinson and Nameless Beet, Early Stonehead, Danish Round Head, Surehead and Marvin Savoy Cabbage, Enormous, Honor Bright, Combination and Trophy Tomato, Dry Weather Cauliflower, Perkin's Long Podded Okra, Stringless Bean, Golden Bantam, Cosmopolitan and County Gentleman Sugar Corn. The Improved Giant, Maule's Mammoth and Burpee's Mammoth, all growing on the same plat and worked alike were very similar to each other.

Of White Potatoes we had a fine crop of Bliss's Early, the yield being at the rate of 200 bushels per acre.

From one acre of Early Cluster Sweet Potatoes we harvested 240 bushels.

Of Spanish and Virginia Peanuts we had an excellent crop.

Many other vegetables were tested but they proved unsatisfactory in yield or quality.

The Cauliflower and Celery demand more than a passing notice. The Dry Weather Cauliflower headed up finely early in the season, and the late crop is still of larger size and better form. The Golden Self-Blanching, Rose-Ribbed and Giant Celery have done remarkably well and show no indications whatever of celery rust.

about 12 feet high, but the Orange appeared to be devoid of saccharine matter, the stalk being dry and pithy in the growing state. The juice of the Early Amber was very abundant and sweet to the taste. We have had many inquiries concerning the making of fine sorghum syrup. We had hoped to be able to report our success in this bulletin, but the breaking down of the mill will delay us a week or two in manufacturing the syrup.

OTHER EXPERIMENTAL CROPS.

The United States Department of Agriculture furnished for trial seeds of Horse Bean from Italy, Chickpea, Lupins, Morelle Corn, and Lentils from Egypt, Lentils from Calcutta, and six varieties of Lentils from France, in all fifteen different varieties of seed. The Horse Bean was affected with a black smut and matured but few seed. The Lentils blossomed during a severe drought and we obtained matured seed of but one variety. The Morelle Corn produced ears of medium size, many stalks having two ears. In earliness it is far in advance of any other corn of which I have any knowledge. The kernels on many ears are very shallow, but by careful selection a variety may be developed that may prove valuable for late planting. It is a very hard, glazed kernel variety.

MELON CULTURE.

Of watermelons quite a number of varieties were cultivated in order to test them for earliness, productiveness and quality. The following were grown: Harris' Earliest, New National, Kleckley, Fordhook, Sweetheart, Halbert Honey, McIver Sugar, Peerless, Kolb's Gem, Rattlesnake, Mountain Sweet and Florida Favorite. Harris' Earliest was at least one week earlier than any other variety tested, but the melons were of small size and poor in quality. Kleckley was the best all-round melon in uniformly good size, productiveness and quality. It is by odds the sweetest and tenderest melon I have ever tested. Sweetheart, Halbert Honey and McIver Sugar ranked as equal seconds in quality, but were inferior to Kleckley in quantity. Kolb's Gem from firmness of rind would prove the best shipper. In size it was uniformly large and of fairly good quality. Owing to the late rains the vines took on a second growth and produced a second crop that lasted almost till frost.

Of cantaloupes we planted the following varieties: Grand Rapids, Montreal, Delmonico, Rocky Ford, Pedigree, Banana, Paul Rose, Rose Gem, Matchless, Emerald Gem and Miller's Cream. The Rocky Ford (Netted Gem) was by far the finest in quality and most productive. In some hills the melons actually touched each other. (See photograph of one hill). The Pedigree, grown by me for many years from carefully selected specimens of the Montreal, has improved in size so far beyond the parent variety that specimens measured 30 inches in circumference and 8 inches in thickness from stem to blossom end. One year's experience would lead me to believe that melon culture could be made very profitable in this section, were there as cheap shipping rates as in melon-growing sections.

SIXTEEN ROCKY FORD CANTALOUPES GROWING ON ONE VINE

TOBACCO CULTURE.

One of the primary objects of the Test farm is to experiment with tobacco, in the line of finding out the best character of soil adapted to growing various kinds; best fertilizers and most expeditious and economical methods of curing. For this purpose two acres were planted upon land cleared for that purpose with Wahn, a variety adapted to producing "Bright" tobacco. One acre was planted with Kentucky Yellow, a variety that in curing produces "Red," "Mahogany" or "Shipping" tobacco. One acre in Pennsylvania Seed Leaf, a variety grown exclusively in Pennsylvania for cigar tobacco.

The usual methods of preparing the soil, planting and cultivating were adopted, using a special tobacco fertilizer containing 3 per cent. ammonia, 8 per cent. phosphoric acid and 5 per cent. potash, at the rate of 600 pounds per acre. These varieties all made a fine growth and promised a fine crop, but on August 4th a hail storm following a very high wind ruined the Pennsylvania Seed Leaf and Kentucky Yellow. Not a single plant escaped injury in these two varieties. The Wahn was not injured to so great an extent but the leaves were torn so that no "wrapper" tobacco could be found. The Pennsylvania Seed Leaf prior to the hail storm had some leaves 37 inches long and 26 inches wide of a fine silky texture, and promised a good crop of cigar tobacco. This storm was followed by others August 6th and 9th and left little but "lugs." It is a well-known fact that tobacco injured by hail never can be cured properly, so we have reached no definite results in our curing operations. The tobacco, however, such as we had, has colored up remarkably well. I am led to believe, from one year's experience, that cigar tobacco can be grown in Virginia, on good, strong, loam lands. My practical knowledge of tobacco growing is of this particular variety, and the Wahn and Kentucky Yellow were managed entirely by Mr. S. D. Barksdale, a successful grower of many years experience.

TOBACCO UNDER COVER.

It was decided by the Farm Committee that we should try the cultivation of tobacco under cover, a method that has proven successful, after years of experimenting, in several Southern States and in Connecticut. One half acre was enclosed with boards to the height of seven feet, and covered two-thirds with plastering lath with a space of one inch between the lath, and one-third with "plant-bed cloth." Owing to difficulties in obtaining the boards and delays in procuring lath to cover the portion prepared for that purpose, the yard could not be completed in proper time for planting. The laborers who assisted in constructing the yard being tobacco-raisers, whenever a "season" for planting occurred, quit work and planted their own crops. The drought of June had come on before the yard was finished. Our plants had become overgrown, yet we selected the smaller and planted, watering each plant with about a pint of water. We planted principally Sumatra and Cuban tobaccos, but tried a few rows each of the three varieties we had planted in the open field. The plants had scarcely firmly established themselves in the ground until we had very heavy rains and the ground never became sufficiently

dry for working the tobacco during the entire season. We waited as long as possible before working, but threatening weather compelled us to work the ground when we knew it would not be beneficial to the growing crop. Twice during the season the canvass was torn into tatters by high winds and heavy hail.

The land had been fertilized at the rate of 1,000 pounds cotton seed meal and 400 pounds sulfate potash per acre. The crop was not sufficient to enable us to attempt the process of fermentation necessary in curing these tobaccos. The land has been seeded to produce a crop of vegetable matter to be plowed under next spring, and we hope to repeat the experiment at proper time, under more favorable conditions, with better results. Quite a number of years were required in other States before success crowned the effort and tobacco is now grown in them equal to that imported from Sumatra or Cuba, commanding the same price in market. We shall continue until we are satisfied that tobacco either can or cannot be grown profitably by this method in this section.

BACTERIATED SOIL.

Certain plants known to the botanist as Legumens, to which belong peas, beans, clovers, vetches, etc., have the power of extracting free nitrogen from the atmosphere, and by assimilating it through the agency of *bacteria*, one of the lowest types of vital organisms, form nodules or "nitrogen traps" on the roots. Ammonia (N. $H.^3$) one of the most expensive of commercial fertilizers, consists of 14-17ths nitrogen. By the judicious use of these plants it is possible to impregnate the soil with these bacteria and materially assist our crops of peas, beans, clovers, vetches, etc., in extracting the free nitrogen from the atmosphere and thus enrich our soil.

The same bacteria is not found on all the different legumens. That on the Southern cow-pea, so called, differing materially from that found on the Alfalfa clover (Lucerne).

We were kindly furnished with a quantity of soil this season from the Kentucky Experiment Station, with which we treated the seed of cow-peas, Velvet beans and Soy (Soja) beans.

The soil was reduced to the consistency of cream with water, and the seeds were immersed in the mixture for about thirty minutes and planted in drills already prepared for them. This process necessitates planting by hand, as any drill would remove the thin coating of soil.

All of the crops thus treated show that the operation was successful.

Alternate rows of peas, beans and Velvet beans, treated and untreated, were planted side by side, and whilst many of the plants thus treated show from 50 to 80 nodules, no more than 5 per cent. of the untreated plants show more than one nodule, the rest showing none.

The nodules on the Soy beans were most numerous and the largest, whilst those on the cow-peas, nearly as numerous, were much smaller.

On the Velvet beans the nodules were less numerous and very small.

From one year's experience we would infer that the Soy bean is the most suitable plant for this purpose.

SOY BEANS GROWN ON INOCULATED SOIL.

We propose to put the same land in the same crops, seed similarly treated, for a series of years.

It is said to take about three years to thoroughly impregnate the soil.

We hope to be able at that time to furnish farmers of the State, who desire to conduct this experiment with soil for that purpose, as a few quarts of it will be sufficient to prepare the seed for 25 acres.

SOY BEAN ROOTS GROWN ON INOCULATED SOIL.

Note the large number of small pin head nodules formed from the first year's inoculation of the soil.

(The above illustration shows the effect of one season's treatment of the seed.)

A gentleman, Mr. Stubbs, of Gloucester county, Va., has kindly furnished us with soil containing the Alfalfa clover bacteria.

A portion of one field of Alfalfa was treated with this bacteria, but at present writing no nodules have been discovered, as the plants are only an inch or two in height.

About 25 acres of the poorer portions of our corn fields were sown to cow-peas before last working, in order to change the physical condition of the soil by allowing them to stand during the winter, to plow under next spring.

The roots, foliage and stalks will furnish vegetable matter, so much needed on these lands.

The following varieties were sown: Black, Black-eye, Clay, Wonderful, Whip-poor-will and Shinney.

The Black produced the most luxuriant growth of vine, and is the one best adapted for making hay, and a vast growth for fertilizing. The Shinney was most productive of pods, and as a feeding variety would make up for lack of vine and foliage by the greater proportion of peas.

On the many plants examined a very few were found to have any nodules, and these were of a very small size.

As a forage crop for cattle or swine, I know no other plant that will furnish as much food for the small expense incurred, if the seed be grown on the farm. We have gathered over 8,200 lbs. of pods, at the rate of 25c. per 100 lbs. These should yield about 70 bushels of peas, at a cost of about 21 dollars for gathering.

It is poor economy for any farmer to purchase seed at a high price when they can be grown so easily and cheaply upon the farm.

We propose to plant them by themselves hereafter, as we found the vines operated materially against the working of the corn harvester. By this method a season will be lost to the production of any other crop, but, all in all, we believe it to be the true method of enriching the soil and eradicating weeds by this most valuable legumen.

SPECIAL FERTILIZERS.

During the season of 1902 we conducted quite a number of experiments with sodium nitrate and sulfate potash.

The crops were such that we gathered them from time to time, and could not weigh, as in the hay experiments. On melons, both watermelons and cantaloupes, where applied, the crop was increased at least 50 per cent.

The sodium nitrate produced a more vigorous growth of vine where applied, and the sulfate potash added to setting and maturing more fruit.

The sulfate potash produced the better results of the two special fertilizers on potatoes and turnips. The sodium nitrate made a great growth of foliage on the turnips, but the sulfate potash produced the smoother and larger roots.

On cabbage and cauliflower the use of both combined was very marked. On tomatoes the sulfate potash produced the finer fruits, whilst the sodium nitrate produced the more vigorous growth of plants.

On plants set out later in the season the advantage appeared to be with the sodium nitrate, as the plants appeared more vigorous, producing blossoms, green and ripe fruits till frost. The action of these fertilizers appears to be as follows: Sodium nitrate materially increases the growth of the plant and sulfate potash acts as beneficially in increasing and maturing the fruit of the several crops.

A judicious use of both combined, perhaps, would produce the best results.

KEEPING SWEET POTATOES.

Many parties have reported their inability to keep sweet potatoes over winter—some having lost their entire crop.

SHINNEY PEAS, GROWN ON INOCULATED SOIL.

During the fall of 1901 we constructed a cellar (commonly called a kiln), in which we preserved our crop in excellent condition. Select a hill side, if possible, with a southern exposure, where water will not rise from beneath, and excavate a cellar proportionate to the crop grown.

Our cellar is 14 ft. by 7½ ft., and 5 ft. deep after being completed.

On the bottom place sills at least 6 inches high, and cover with boards 1 inch apart for the circulation of air. Place 2 inch by 4-inch studding upright on the four sides of the cellar, and closely cover with 1-inch boards. Cover the top closely with loose boards, in order to store the potatoes easily and admit air until freezing weather, when put on the board covering and about six inches of leaves, with about an inch of soil to keep leaves in position.

In one corner of the cover place a man hole 2 ft. by 2 ft., and 1 ft. deep, made of boards nailed together. Near the bottom of the man-hole nail cleats, to hold a false bottom. Make a cover, with a lift, to entirely cover the top of the man-hole.

A bag filled with chaff or leaves placed in the man-hole, between false bottom and top cover will exclude all frost. A permanent ladder fastened to one side of the man hole, and extending to the bottom of the cellar, will enable any one to get to the potatoes easily.

In the middle of the cover place two ventilating flues made of 8-inch boards, the one extending to within an inch of the floor, and the other only reaching the potatoes when first put in.

These flues extend about 2 ft. above the ground cover.

The longer flue carries cold air to the bottom of the cellar, and the shorter one carries the warm air from off the potatoes.

These should be kept open warm days and nights, and should be stuffed with bags at the top during freezing weather.

A ditch should be dug around the cellar sufficiently deep to carry off surface water during rains.

The whole structure should be covered with a roof, to keep rain and snow from the earth covering. The sides are not covered. Our roof is 7 ft. from the covering on the south sides, and slopes to the ground on the north. A cellar of the above dimensions will hold 420 bushels.

DIFFERENT METHODS OF PLANTING.

Many experiments in planting corn, extending through a series of years, have established the fact that more corn per acre can be raised by allowing two or three stalks to the hill than by thinning to a single stalk.

The custom in this section of the State is to thin to a single stalk, a laborious and expensive operation.

To test this method with the hill method, the fourth row of each plat was planted three kernels at a place, the stand being two or three stalks to each hill. The other rows of each plat were thinned to single stalks about 20 inches apart. All of the plats showed more corn on the fourth row.

Plats 1, 9, 13, 16, 20, 23, 26, 30, and 36 were chosen, covering nearly all the forms of fertilizers, and the fourth row, and one containing a single stalk at each place (third row), were husked separately and weighed.

In all of the corn experiments 70 lbs. were estimated a bushel.

The results are as follows:

Plat 1, fourth row, 32 lbs.; third row, 25 lbs.

Plat 9, fourth row, 35 lbs.; third row, 28 lbs.

Plat 13, fourth row, 38¼ lbs.; third row, 26½ lbs.

Plat 16, fourth row, 39½ lbs.; third row, 26¼ lbs.

Plat 20, fourth row, 33 lbs.; third row, 23 lbs.

Plat 23, fourth row, 18 lbs.; third row, 15 lbs.

Plat 26, fourth row, 38¼ lbs.; third row, 32 lbs.

Plat 30, fourth row, 32 lbs.; third row, 22 lbs.

Plat 36, fourth row, 19¼ lbs.; third row, 10½ lbs.

Average of fourth rows, 31 25-36 lbs. Average of third rows, 23 5-36 lbs.—a gain of 8 5 9 lbs. per row, or a gain of 51 1-8 lbs. in favor of the hill system on one-tenth of an acre, or 513 1-3 lbs. per acre, equal to 7 bushels, 23 1-3 lbs. per acre.

Experiments conducted on my own place for quite a number of years were in results about the same as above reported, excepting in very dry seasons, when results were in favor of the single stalk. But as no one can foretell the weather a season in advance, any method or operation is but experimentation.

The gain of these plats per acre, reported separately, would have been:

No. 1, 6 bushels per acre.

No. 9, 6 bushels per acre.

No. 13, 10 bushels, 5 pounds per acre.

No. 16, 11 bushels, 25 pounds per acre.

No. 20, 8 bushels, 40 pounds per acre.

No. 23, 2 bushels, 40 pounds per acre.

No. 26, 4 bushels, 65 pounds per acre.

No. 30, 8 bushels, 40 pounds per acre.

No. 36, 7 bushels, 35 pounds per acre.

PERMANENT IMPROVEMENTS.

There have been erected, under my supervision, a very fine dwelling house at a cost of about $3,000, an ice-house entirely above ground, two flue-curing tobacco barns, 18 ft. by 18 ft., one tobacco barn for curing export tobacco, 22 ft. by 22 ft., a frame packing house 22 ft. by 24 ft., a granary 21 ft. by 25 ft., and an enclosure of one-half acre, 7 ft. high, for growing tobacco under cover.

The dwelling house is a model of convenience, and the entire first floor, excepting the kitchen, can very readily be thrown into one room for conventions or farmers' institutes.

THE ICE HOUSE.

I have received so many inquiries concerning the construction of the ice-house that I shall briefly describe it. It is built entirely above ground, is 12 ft. by 15 ft., and 13 ft. high to the eaves.

Brick piers 2 ft. by 1 ft. were built at each corner, with a middle pier

on the longer sides. Sills 8 in. by 12 in. were placed flat-wise on these piers, on which studding 2 in. by 6 in., and 13 ft. high were toe-nailed. The studding was weatherboarded on the outside and lined closely on the inside with inch boards. This constituted an air chamber 6 inches wide around the entire building. Studding 2 in. by 4 in. of the same height were toe-nailed flush with inner face of each sill and closely lined with 1-inch boards. As the inner surface was being lined sawdust was filled between the inner and middle lining, thus forming another non-conductor of external heat.

The plan generally adopted is to fill the outer space with sawdust and have the inner chamber as the air chamber.

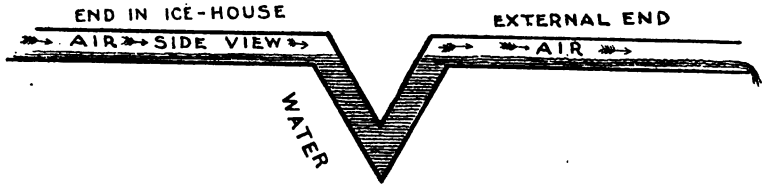
The lining, packed with sawdust on both sides when house is filled with ice, is the only one likely to decay, and by having the sawdust in the inner chamber the lining can be replaced without disturbing the outside of the house when necessary.

The door—there are two, one above the other—was a double one, having both air and sawdust chambers, and was flared as are the doors of a fire-proof safe. The surface soil was removed from within and the compact sub-soil was made basin-shape to collect the water from the ice that melted.

A drain-box, made of planed boards, with the joints white-leaded, extended from the deepest part of the clay bottom to the outside of the building. The bottom was covered with coarsely broken stone to the lower edge of the sill, for the free percolation of the water through the sawdust, placed upon the broken stone level with the upper surface of the sill.

In each gable was placed a window 18 in. by 24 in., slatted. We found it necessary to remove these slats, to provide a free escape of hot air always found over the ice. Where drain tile can be had, what is known as a V joint will provide for the escape of the water and prevent the ingress of air. A box drain with an opening 2 inches square can be constructed where tile cannot be obtained by any ordinary mechanic.

Form of drain:



The V-shaped part was constantly filled with water and prevented the ingress of air. The drain was placed at such a slope that when the V became full the surplus flowed from the ice-house.

The house was filled with ice about three inches thick in December, 1901, pounded so as to have as few air spaces as possible. After the ice had melted about four inches from the sides this space was filled with sawdust, and the ice on top covered about one foot deep. The ice kept perfectly during the entire season until November. For this latitude the ice-house should be built in a grove, if possible, to ward off the intense summer heat. Ours

was built in the open, but we propose to plant one dozen North Carolina poplars, a rapid growing tree, on the east, south and west sides.

An ice-house of this size will hold 58 tons if well packed.

The entire cost of the building, including two coats of white-wash on sides and roof, was $85.

LIVE STOCK.

At present there are 6 valuable mules, 1 horse, 12 young cattle (mostly 2 years old), about 100 thoroughbred White Plymouth Rock fowls and 2 Bronze turkeys on the farm.

FARMING IMPLEMENTS.

1 Self-binder.
1 Mower.
1 Corn Harvester.
1 Disc Plow.
1 Corrugated roller.
1 Cut-away disc harrow.
1 Smoothing harrow.
1 Spring-tooth harrow.
1 No. 40 Chilled plow.
2 No. 19 Chilled plows.
3 One-horse plows.
5 Cultivators.
4 Double shovel plows.
2 Single shovel plows.
2 4-horse wagons.
1 1-horse wagon.
1 Grain drill.
1 Grind-stone.
4 Sets wagon gears.
5 Sets plow gears.
1 Fanning mill.
1 Hay rake.
1 Cockle separator.
Hoes, axes, mattocks, etc.
1 Stump lifter.
1 Road scoop.
1 Complete set carpenter tools.

SUGGESTIONS.

In order that this farm may prove a success, a credit to the State and be of benefit to farmers, a vast amount of work must be provided for and done. The farm should be fenced in order that stock may be kept as grass lands are formed.

The best cattle, sheep and swine should be procured for breeding pur-

poses, so that farmers may be enabled to improve their stock by purchasing progeny of the same at nominal prices.

The one great want of the farm is stock with which to convert the roughage into manure.

The crops of the farm should be consumed thereon instead of being sold. "Every dollars' worth of this fertility that has not been returned to the soil is a bonded indebtedness which will exact exorbitant interest by way of reduced crops until that which rightfully belongs to the soil has been returned." Ditches are required to reclaim fertile land which we are not able now to cultivate. A dyke is needed to protect from overflow the only land of any size sufficiently level for plat experimental purposes.

At present we are obliged to use the same lands for the same crops two years in succession, and have these plats remote from each other, as all the tillable land not thus used is entirely too hilly for experimental purposes.

Trenches and terraces are needed on the hill-sides to prevent wash, and the destruction of young crops on the low-lands by being covered with silt.

A new barn in which the live stock can be properly housed, with ample mows for holding grain and hay, is a matter of the utmost importance.

Sylvan Hill, Nov. 15, 1902. S. B. HEIGES, Manager.

No. 12.

THE BULLETIN

OF THE

DEPARTMENT OF AGRICULTURE

OF

VIRGINIA,

RICHMOND, DECEMBER 31, 1902.

ANALYSIS OF FERTILIZERS

THIS BULLETIN IS SENT FREE TO FARMERS ON APPLICATION.

PUBLISHED QUARTERLY.

DEPARTMENT OF AGRICULTURE OF THE STATE OF VIRGINIA.

GEORGE W. KOINER, COMMISSIONER.

E. W. MAGRUDER, CHIEF CHEMIST.

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DIVISION OF CHEMISTRY.

REPORT OF CHIEF CHEMIST.

Hon G. W. KOINER, *Commissioner of Agriculture*:

Sir,—The work of this division is steadily increasing, due to the fact that the farmers have become better acquainted with the advantages offered by the Department of Agriculture and have learned better the value of a fertilizer analysis, and find that the value of a fertilizer is entirely dependent on the amount of fertilizing ingredients it contains, and not at all on the name.

WORK OF THE YEAR.

There have been analyzed in the Laboratory during the past season 843 samples of fertilizers collected by inspectors; 115 special samples sent in by farmers, besides a number of samples of fertilizer materials, such as phosphate rock, ashes, plaster, marl, &c., besides the identification and qualitative determination of a very large number of various other minerals. The number of applications for the analysis of minerals and mineral waters is very large, all of which have to be refused, as there are no funds available for such purposes. It would be very desirable if the State would make an appropriation to carry on such work. The amount required would be small, and the benefit, both to the individual and to the State, very great.

THE FERTILIZERS SOLD.

I have to report the number of brands of fertilizer registered still continues to increase, there being 1,342 brands registered this year, which is an increase of 59 over last year. This is a very useless multiplication of names, and I very strongly urge that active steps be taken to reduce this superabundance of words. There are registered 123 brands of fertilizers which are guaranteed to contain 8 per cent. phosphoric acid, 2 per cent. ammonia, 2 per cent. potash; and there are also 49 brands which contain 8 per cent. phosphoric acid, 1 per cent. ammonia and 1 per cent potash. What is the good of this useless multiplication of names, when one of these fertilizers is as good as another for most crops? The farmer does not need so many names and the manufacturer does not desire it, but from what I can learn the fertilizer agent is responsible for much of the excessive number of brands.

QUALITY OF THE FERTILIZER.

The quality of the fertilizer put on the market this year is much better

than that of last year, but there is still plenty of room for improvement, as is shown by the following table of comparison:

	1900. Per cent.	1901. Per cent.	1902. Per cent.
Fertilizers falling below guarantee	26.84	26.66	11.55
Fertilizers falling 10 per cent. below guarantee	2.29	1.69	.84
Fertilizers falling below guarantee in phosphoric acid	16.87	24.61	4.21
Fertilizers falling below guarantee in ammonia	43.00	40.42	42.81
Fertilizers falling below guarantee in potash	34.27	24.34	31.65
Fertilizers falling 10 per cent. or more below guarantee in phosphoric acid	..	..	.38
Fertilizers falling 10 per cent. or more below guarantee in ammonia	..	..	25.18
Fertilizers falling 10 per cent. or more below guarantee in potash	..	..	17.87

From the above it can be seen that the quality of the fertilizer has improved very much as to the amount falling below guarantee, and also as to that falling 10 per cent. below guarantee. The fertilizers have also improved very markedly in the amount of phosphoric acid they contain, but they have fallen off in the amount of ammonia and potash they contain, and are about as bad as they were in 1900 in respect to those two ingredients. As practically nothing can be told about a fertilizer by looking at it, except its mechanical condition the only way for a farmer to be certain of what he gets is to have it analyzed, which he can have done free of cost by sending a properly-drawn sample to this Department.

DISSEMINATION OF THE RESULTS OF THE CHEMICAL WORK.

With this issue five bulletins have been published and distributed to farmers this year. They contain the analysis of samples of fertilizer collected by the inspectors, a list of brands of fertilizer registered with the Commissioner, and short articles on fertilizers and their use.

PURE FOODS.

The amount and extent to which food and feeding stuffs are adulterated still continues to increase. Nearly all the States around us have pure-food laws in operation, and the number of States with effective food laws are increasing yearly, and they are enforcing these laws more strictly each year. Thus, as the field where adulterated foods can be disposed of with impunity becomes smaller the greater will be the amount of the adulterated articles disposed of in those States which do nothing to keep them out. I therefore strongly recommend that funds be obtained for putting in operation the pure-food laws now on the statute books.

Respectfully submitted,

E. W. MAGRUDER,
Chief Chemist.

FERTILIZER ANALYSIS—SEASON 1902.

On December 28, 1899, the Legislature amended the laws governing the fertilizer control of the State, which is in charge of the Department of Agriculture. The following is a summary of the principal provisions of the law:

1. Every fertilizer manufacturer or dealer is required annually to register with the Commissioner of Agriculture all brands of fertilizers to be sold in the State.

2. All packages of fertilizer shall have printed on them the name of the brand, name of manufacturer, place of manufacture, and the guaranteed analysis showing the per cent. of available phosphoric acid, ammonia, and potash soluble in water, contained in the fertilizer.

3. Each package of fertilizer shall have a tag attached, which tag is furnished by the Commissioner of Agriculture, and is a guarantee that the law has been complied with. Farmers are cautioned to buy no fertilizer untagged, as such has not met the requirements of the law, and is likely to be fraudulent.

4. Inspectors are to be sent out by the Commissioner, whose duties are to see that the requirements of the law are carried out, and to collect samples of fertilizer on the market. These samples are analyzed by the chemist of the Department.

5. Upon the request of the purchaser, every seller of fertilizer shall draw a sample of fertilizer at the time of its delivery, in the presence of the purchaser, or if the seller is not present, any justice (who shall be paid twenty-five cents for his services), shall, in the presence of the buyer, draw a sample of the fertilizer. The sample, when drawn, shall, in the presence of both parties, be put in a glass or tin can, securely sealed, and a certificate tied to it (not glued), signed by both parties, certifying that the sample is a fair and correct one. The sample is then sent to the Department, where it is analyzed and a copy sent to both buyer and seller free of cost. Farmers are invited to avail themselves of this provision of the law, and blank forms with instructions for sampling will be sent on request.

6. If the sample of fertilizer drawn in any of the above ways, on analysis falls 10 per cent. in value below the guaranteed value, the purchaser cannot be compelled to pay for the fertilizer, or if he has paid, the money can be recovered.

HOW TO DRAW A SAMPLE OF FERTILIZER.

Parties drawing samples of fertilizer for analysis should keep a record of same, so that, on the receipt of the analysis, the fertilizer may be identified.

At least 10 per cent. of the bags in a lot of fertilizer should be sampled, and if the number of bags is small, then sample at least ten, if there be so many; if less, sample all. The sample should be taken from as near the centre of the bag as possible, and all lumps should be crushed and the sample thoroughly mixed before the vessels are filled.

Samples must be sent prepaid. No charge will be made for analysis.

The following form of certificate should be made out and attached to all samples agreed on between buyer and seller. Blank forms like the one below will be furnished by the Commissioner on application:

CERTIFICATE MARKED.....

We, the undersigned, do certify that the contents of this vessel is a fair and correct sample of the Fertilizer, drawn by us according to law, on the delivery of the goods to the purchaser, and that the vessel containing the sample was securely sealed and forwarded to the Virginia Department of Agriculture for analysis.

Name of Buyer.....

Post Office .....

Name of Seller .....

Post Office .....

No fertilizer will be analyzed unless sampled in accordance with the law as set forth in section 5, page 3, of this Bulletin, and certified to as there prescribed and as directed above.

EXPLANATION OF THE TABLES.

This Bulletin contains the analysis of 129 samples of fertilizers collected by the inspectors and analyzed since Bulletin No. 11 was issued. With this Bulletin the work of the year is completed.

CO-OPERATION OF FARMERS.

The Department earnestly asks the co-operation of all farmers in the effort to make the fertilizer inspection as useful as possible to all. To this end, information should be sent at once to the Commissioner, if any untagged or unregistered fertilizers are put on the market, or if any irregularities or infringements of the law are observed.

VALUATIONS.

To have a basis for comparing the values of different fertilizers, it is necessary to assign values to the three valuable constituents of fertilizers, *i. e.*, phosphoric acid, ammonia, and potash. The raw materials used by manufacturers in preparing their fertilizers are bought on a basis of the per cent. of the valuable constituents contained in the different materials. It is evident then that the value of a fertilizer is measured by the current price of the raw materials contained in it, plus the cost of manipulation. The relative values, as put down in the tables, have nothing to do with the crop-producing value, but are estimates of the commercial value of the valuable fertilizing ingredients contained in the fertilizer. These values are only approximate, as the cost of fertilizer materials are liable to change as other commercial products, and it would be impossible to assign values which would represent the cost during an entire season. They are based on a careful examination of trade conditions, and are believed to fairly represent the cost of putting the fertilizer on the market. They are most valuable as a means of comparison, and should be mainly used for that purpose.

The farmer should study the analyses of the fertilizers and make his purchases accordingly, and not be led off by any high-sounding name. He should buy strictly by the amount of fertilizing ingredients contained in a fertilizer, and not by the name, as the ingredients are what make the crops grow, and not the name.

VALUATIONS FOR 1902.

The figures which will be used for calculating values in this Bulletin are the same as used last year, and are as follows:

IN UNMIXED OR RAW MATERIALS.

Available Phosphoric Acid	4	cents per pound.
Phosphoric Acid in Animal Bone	3½	" "
Ammonia	13	" "
Potash	4¾	" "

IN MIXED FERTILIZERS.

Available Phosphoric Acid	4½	cents per pound.
Ammonia	15	" "
Potash	5	" "

HOW RELATIVE VALUES ARE CALCULATED.

In the calculation of relative values it is only necessary to remember that so many per cent. means the same number of pounds per hundred, and that there are twenty hundred pounds in one ton (100x20—2,000 pounds—1 ton). Therefore, to find the value per ton, multiply the per cent. of each ingredient by 20, which gives the number of pounds of each ingredient in a ton; then multiply this result by the price per pound of that ingredient; then add up the figures thus obtained for each ingredient, and the sum is the relative value per ton.

As an example, take an 8—2—2 fertilizer, which means that the fertilizer contains 8 per cent. available phosphoric acid, 2 per cent. ammonia and 2 per cent. potash.

The calculation is as follows:

Per cent.=lbs. per 100.	Pounds, per ton.	Value, per ton.
8.....Phosphoric Acid	X20=160 @ 4½	$ 7 20
2.....Ammonia	X20= 40 @ 15	6 00
2.....Potash	X20= 40 @ 5	2 00
Total		$15 20

THIS BULLETIN IS SENT FREE TO FARMERS ON APPLICATION TO

G. W. KOINER,

Commissioner of Agriculture, Richmond, Va.

TABLE No. 1.

Analyses of Fertilizers by the Virginia Department of Agriculture for 1902.

Laboratory No.	Name and Address of Manufacturer and Name of Brand.	From Whom and Where Collected.	Guaranteed and Found.	Phosphoric Acid, Per Cent.	Ammonia, Per Cent.	Potash, Per Cent.	Relative Value Per Ton.
	American Agri. Chem. Co., The, Baltimore, Md.						
2395	Muriate of Potash	E. H. Brown, West Point, Va.	Guar.			50.00	47.50
	" "	" " "	Found			50.08	47.58
2413	Susquehanna Alk line Bone Phos.	In transit to Tappahannock wharf	Guar.	10.00		2.00	11.00
	" " "	" " "	Found	11.75		1.78	12.36
2414	Canton Chem. Baker's Fish Guano	R. F. Broaddus, New Town, Va.	Guar	8.00	2.00	2.00	15.20
	" " " "	" " "	Found	9.53	1.77	1.77	15.66
2415	Susquehanna Grain and Grass Producer.	R. L. Gutridge, Bainsville, Va.	Guar.	12.00		3.00	13.80
	" " "	" " "	Found	13.08		2.55	14.82
2416	Canton Chem. Sol. Alkaline Bone	R. F. Broaddus, New Town, Va.	Guar.	12.00		3.00	13.80
	" " "	" " "	Found	14.20		2.28	15.06
2417	Maryland Langstone Cereal Plant Food	J. O. Omohundro, Maple Grove, Va.	Guar.	9.00	1.50	2.00	14.60
	" " " "	" " "	Found	9.90	1.52	2.05	15.52
2424	Reese's Grass and Grain	P. S. Mathews, Broadway, Va.	Guar.	10.00		2.00	11.00
	" " "	" " "	Found	11.50		1.95	12.30
2425	Reese's Elm Phos	P. S. Mathews, Broadway, Va.	Guar.	14.00			11.20
	" "	" "	Found	15.15			12.12
2426	Reese's Dis. S. C. Phos.	P. S. Mathews, Broadway, Va.	Guar	14.00			11.20
	" " "	" " "	Found	16.60			13.28
2427	Reese's Harvest Queen	R. S. Clark, Broadway, Va.	Guar.	8.00	1.25	2.00	12.95
	" "	" " "	Found	9.83	1.12	1.89	14.10

2428	Great Eastern Dis. Bone	J. T. Acker, Broadway, Va.	Guar.	14.00	....	....	11.20
	" " " "	" " "	Found	14.73	....	....	11.78
2429	Smith & Baker's Am'd Bone Phos	Smith & Baker, Berryville, Va.	Guar.	8.00	1.00	1.00	11.20
	" " " "	" " "	Found	9.00	.97	1.14	12.15
2430	Tygert Allen's Charl'n Guano for Corn and Spring Crops	Smith & Baker, Berryville, Va	Guar.	10.00	....	2.00	11.00
	" " " " "	" " "	Found	10.10	....	1.35	10.44
2431	Lupton's X X V Phosphate	H. S. Lupton, Winchester, Va.	Guar.	8.00	1.00	1.00	11.20
	" " " "	" "	Found	9.13	.95	1.00	12.07
2432	Soluble Bone and Potash	Shenandoah Farmers Union, Bowman, Va.	Guar.	10.00	....	2.00	11.00
	" " "	" " "	Found	12.40	....	1.90	13.06
2433	Susquehanna Dissolved S. C. Bone	Berryville Milling Co., Berryville, Va.	Guar.	14.00	....	....	11.20
	" " " "	" " " "	Found	15.33	....	....	12.26
2434	Canton Chem. Farmers' Economy	A. L. Joiner, Luray, Va.	Guar.	8.00	1.00	1.00	11.20
	" " " "	" "	Found	9.55	1.12	1.67	13.68
2461	Canton Chem. Harrow Brand	Farm. Sup. & Com. Co., Bedford City, Va.	Guar.	8.00	....	1.00	8.20
	" " " "	" " " "	Found	9.50	....	1.02	9.57
2475	Canton Chem. Baker's Spec. Wheat, Corn and Grass Mix.	B. Turner, West Point, Va.	Guar.	9.00	1.00	2.00	13.10
	" " " " "	" "	Found	10.05	1.04	1.73	13.90
2403	Susquehanna Superior Rock Phosphate	B. L. Duvall, Old Church, Va.	Guar.	14.00	....	....	11.20
	" " " "	" " "	Found	14.85	....	....	11.88
2404	Susquehanna Ammoniated Bone Phosphate	B. L. Duvall, Old Church, Va.	Guar.	8.00	2.00	2.00	15.20
	" " " "	" " "	Found	10.20	1.65	1.84	15.97
	Armour Fert. Works, The, Baltimore, Md.						
2418	Beverley's Bone and Potash	Chas. Ball, Blandfield Farm, Va.	Guar.	10.00	....	2.00	11.00
	" " " "	" " " "	Found	10.23	....	1.80	11.01
2435	Brock's Bone and Potash Fertilizer	Rockingham Exchange, Harrisonburg, Va.	Guar.	11.00	....	2.00	11.90
	" " " "	" " "	Found	10.82	....	1.52	11.26
2436	Brock's Own Mixture	Rockingham Exchange. Harrisonburg, Va.	Guar.	10.00	1.00	3.00	15.00
	" " "	" " "	Found	11.50	.94	2.67	15.84
2458	Armour's Acid Phosphate	Spindle & Childress, Christiansburg, Va.	Guar.	16.00	....	....	12.80
	" " " "	" " "	Found	17.13	....	....	13.70
2466	Armour's Dissolved Animal Bone	Davidson Bros., Lexington, Va.	Guar.	11.00	2.50	....	17.40
	" " " "	" " "	Found	13.15	1.98	....	17.78

TABLE No. 1—CONTINUED.

Laboratory No.	Name and Address of Manufacturer, and Name of Brand.	From Whom and Where Collected.	Guaranteed and Found.	Phosphoric Acid Per Cent.	Ammonia, Per Cent.	Potash, Per Cent.	Relative Value Per Ton.
	American Fertilizing Co., Norfolk, Va.						
2470	H. G. Acid Phosphate	R. W. Fuqua, Prospect, Va.	Guar.	14.00	....	....	11.20
	" " "	" " "	Found	15.23	....	....	12.18
	Alexandria Fertilizing & Chem. Co., Alexandria, Va.						
2473	Ammoniated Bone Superphosphate	R. S. Cochran, The Plains, Va.	Guar.	9.00	2.00	1.50	15.60
	" " "	" " "	Found	9.57	1.52	2.32	15.49
	Baugh & Sons Co., Baltimore, Md.						
2378	Baugh 16% Acid Phosphate	Coles Bros. & Morris, Glade Spring, Va.	Guar.	16.00	....	....	12.80
	" " "	" " "	Found	16.70	....	....	13.36
2379	Baugh Muriate of Potash	Coles Bros. & Morris, Glade Spring, Va.	Guar.	....	....	50.00	47.50
	" " "	" " "	Found	....	....	46.88	44.53
2380	Baugh H. G. Potash Mixture	Painter Quisenberry, Meadow View, Va.	Guar.	10.00	....	4.00	13.00
	" " "	" " "	Found	12.98	....	4.14	15.82
2393	Baugh A. A. Nitrogen	Black & Bowman, Staunton, Va.	Guar.	....	13.00	....	33.80
	" " "	" " "	Found	....	11.70	....	30.42
2394	Baugh Manure Salt	Black & Bowman, Staunton, Va.	Guar.	....	....	30.00	28.50
	" " "	" " "	Found	....	....	49.82	47.33
2421	Baugh H. G. Acid Phosphate	Baugh & Sons Co., Tunstall, Va.	Guar.	14.00	....	....	11.20
	" " "	" " "	Found	17.08	....	....	13.62
	Baker & Co., Winchester, Va.						
2437	Ammoniated Superphosphate	Baker & Co., Winchester, Va.	Guar.	8.00	2.00	2.00	15.20
	" " "	" " "	Found	9.98	1.84	1.94	16.44
2438	Soluble Superphosphate	Baker & Co., Winchester, Va.	Guar.	11.00	....	2.00	11.90
	" " "	" " "	Found	12.13	....	1.59	12.51
2439	Ammoniated Soluble Phosphate	Baker & Co., Winchester, Va.	Guar.	8.00	1.00	1.00	11.20
	" " "	" " "	Found	10.15	1.12	2.83	15.33

	Baltimore Pulverizing Co., Baltimore, Md.						
2450	Penniman's Special Guano	M. H. Hattle, Woodstock, Va	Guar.	8.00	1.00	1.00	11.20
	" " "	" "	Found	8.83	.96	1.17	11.97
	Bryant Fert. Co., The, Alexandria, Va.						
2472	Ammoniated Dissolved Bone	G. W. Hunter, Occoquan, Va	Guar.	8.00	3.00	1.00	17.20
	" " "	" "	Found	9.48	2.04	.95	15.78
	Columbia Guano Co., Norfolk, Va.						
2383	Columbia Bone and Potash	Farmers' Protective Union, Marion, Va	Guar.	10.00	....	4.00	13.00
	" " "	" " "	Found	10.08	....	3.28	12.35
2460	Columbia Bone and Potash Mixture	Spindle & Childress, Christiansburg, Va	Guar.	10.00	....	2.00	11.00
	" " " "	" " "	Found	10.93	....	1.56	11.40
	Continental Commercial Co., Baltimore, Md.						
2441	Special Peerless Phosphate	John Filler, Bridgewater, Va	Guar.	8.00	1.00	4.00	14.20
	" " "	" "	Found	9.48	1.10	3.40	15.23
2440	Superior Crop Grower	John Filler, Bridgewater, Va	Guar.	12.00	....	4.00	14.80
	" " "	" " "	Found	13.35	....	3.08	15.03
	Durham Fert. Co., Branch Va. C. C. Co., Richmond, Va.						
2471	Diamond Wheat Grower	Garnett & Gibson, in transit	Guar.	10.00	....	3.00	12.00
	" " "	" " "	Found	10.48	....	2.52	11.95
	Decker & Alrich, Fredericksburg, Va.						
2423	Button Bone Dust	Decker & Alrich, Fredericksburg, Va.	Guar.	23.00	4.00	....	26.50
	" " "	" " "	Found	26.30	3.56	....	27.81
	Griffith & Turner Co., Baltimore, Md.						
2419	Griffith & Turner, Animal Bone Phosphate	W. W. Allmond, Allmondsville, Va	Guar.	10.00	2.50	1.50	18.00
	" " " " "	" " "	Found	9.18	1.34	1.86	14.14
	T. H. Gill, Avalon, Va.						
2420	Gill's Fish Mixture	T. H. Gill, Avalon, Va	Guar.	9.00	2.00	2.00	16.10
	" "	" "	Found	9.48	1.65	1.82	15.30
	Griffith & Boyd, Baltimore, Md.						
2442	Griffith & Boyd, Bone Meal	Rockingham Exch., Harrisonburg, Va.	Guar.	22.00	4.00	....	25.80
	" " " "	" " "	Found	25.00	2.72	....	24.57
2443	Griffith & Boyd Beef, Blood and Bone Mixture	Rockingham Exch., Harrisonburg, Va	Guar.	8.00	2.00	2.00	15.20
	" " " " "	" " "	Found	9.10	1.33	2.05	14.23
	Hubbard & Co., M. P., Baltimore, Md.						
2398	Hubbard & Co., Sol. Bone and Potash Phos	G. W. Jeffress, Little Plymouth, Va.	Guar.	d0.00	....	2.00	11.00
	" " " " "	" " "	Found	12.23	....	1.65	12.75
2399	Harvest King for Wheat and Grass	G. W. Jeffress, Little Plymouth, Va.	Guar.	9.00	1.50	1.50	14.10
	" " " "	" " "	Found	11.58	1.40	1.78	16.40

TABLE No. 1—CONTINUED.

Laboratory No.	Name and Address of Manufacturer, and Name of Brand.	From Whom and Where Collected.	Guaranteed and Found.	Phosphoric Acid Per Cent.	Ammonia, Per Cent.	Potash, Per Cent.	Relative Value, Per Ton.
	Hanover Fertilizing Co., Baltimore, Md.						
2444	Hanover Dissolved Raw Bone	J. T. Acker, Broadway, Va.	Guar.	10.00	2.00	....	15.00
	" " " "	" " "	Found	12.90	1.62	....	16.47
2445	Hanover Blood and Bone Compound	J. T. Acker, Broadway, Va.	Guar.	8.00	1.00	2.00	12.20
	" " " "	" " "	Found	8.75	.95	2.18	12.91
2446	Hanover Royal Bone and Potash	J. T. Acker, Broadway, Va.	Guar.	9.00	....	2.00	10.10
	" " "	" " "	Found	9.15	....	1.33	9.57
2447	Hanover Farmer's Crop Winner	G. W. Garvin, Boyce, Va.	Guar.	7.00	.50	1.50	9.30
	" " "	" " "	Found	8.83	.62	1.85	11.66
	Hess & Bro., S. M., Philadelphia, Pa.						
2451	Wheat and Grass Manure	G. W. Garvin, Boyce, Va.	Guar.	8.00	1.00	2.00	12.20
	" " "	" " "	Found	8.90	.65	2.18	12.14
	Lee & Son, A. S., Richmond, Va.						
2407	Lee's Special Wheat Fertilizer	J. L. Blunt, Verdon, Va.	Guar.	9.00	....	1.00	9.10
	" " " "	" " "	Found	9.28	....	1.01	9.36
	Lynchburg Guano Co., Lynchburg, Va.						
2454	Spartan Acid Phosphate	P. H. Crawford, Christiansburg, Va.	Guar.	12.00	....	....	9.60
	" " "	" " "	Found	14.23	....	....	11.38
2474	Lynchburg H. G. Acid Phosphate	N. H. Turbyville, Danville, Va.	Guar.	14.00	....	....	11.20
	" " "	" " "	Found	15.98	....	....	12.78
	Miller & Son, Wm A., Lynchburg, Va.						
2459	Miller's Wheat and Grass Fertilizer	W. A. Miller & Son, Lynchburg, Va.	Guar.	8.00	1.00	1.00	11.20
	" " " "	" " " "	Found	10.23	.90	.85	12.78
	Ober & Sons Co. G., Baltimore, Md.						
2401	Ober s Special Plant Food	J. E. Beard & Co., Broadway, Va.	Guar.	8.00	2.00	5.00	18.20
	" " "	" " "	Found	12.30	2.87	2.72	22.40

	Powhatan Chemical Co., Richmond, Va.						
2381	H. G. Acid Phosphate	A. J. Greenwood, Marion, Va.	Guar.	14.00	.....	....	11.20
	" " "	" " "	Found	14.46	.....	....	11.57
2382	Bone and Potash Mixture	J. A. Greenwood Marion, Va.	Guar.	10.00	.....	2.00	11.00
	" " "	" " "	Found	12.08	.....	2.09	12.96
	Packer's Fert. Association, Chicago, Ill.						
2384	Packer's Bone and Potash	Kebler & Rodgers, Bristol, Va.	Guar.	10.00	.....	2.00	11.00
	" " "	" " "	Found	10.52	.....	1.64	11.11
2385	Packer's Potash Phosphate	Kebler & Rodgers, Bristol, Va.	Guar.	10.00	.....	4.00	13.00
	" " "	" " "	Found	10.95	.....	3.44	13.30
2386	Packer's Ammoniated Bone and Potash	Kebler & Rodgers, Bristol, Va	Guar.	10.00	1.00	1.00	13.00
	" " " "	" " "	Found	10.68	1.05	1.03	13.78
	Patapsco Guano Co., Baltimore, Md.						
2452	Patapsco Acid Phosphate	A. G. Bailey, Luray, Va.	Guar.	14.00	.....	....	11.20
	" " "	" " "	Found	13.88	.....	....	11.10
2400	Patapsco Pure Ground Bone	In transit to Land Level, Va.	Guar.	20.62	4.50	....	26.33
	" " " "	" " "	Found	19.62	3.78	....	23.58
2402	Patapsco Sol. Bone and Potash	F. M. Stimspring, Cowan's Va	Guar.	10.00	.....	2.00	11.00
	" " " "	" " "	Found	11.63	.....	2.14	12.61
2422	Patapsco Special Wheat Compound	E. W. Mills, Fredericksburg, Va.	Guar.	9.00	2.25	2.50	17.35
	" " " "	" " "	Found	10.55	2.09	2.80	18.57
	Pollock, R. H., Baltimore, M. D.						
2410	Pollock's Special Wheat Grower	A. Wilkins, Oak Grove, Va.	Guar.	8.00	1.00	2.00	12.20
	" " " "	" " "	Found	9.63	1.13	2.09	14.15
2411	Pollock's Dis. S. C. Phos.	Geo. T. Johnson, Newland, Va.	Guar.	14.00	.....	.....	11.20
	" " " "	" " "	Found	15.68	.....	.....	12.54
2412	Pollock's Soft Ground Bone.	M. S. Dulans, Warsaw, Va.	Guar.	14.00	3.00	.....	17.60
	" " " "	" " "	Found	14.20	2.28	.....	15.87
	Piedmont Mt. Airy Guano Co., Baltimore, Md.						
2453	Levering's Excelsior	Chas. E. Koontz, Elkton, Va.	Guar.	8.00	1.00	1.00	11.20
	" " "	" " "	Found	9.35	.87	1.75	12.78
	Richmond Guano Co., Richmond, Va.						
2387	Premium Wheat Grower	J. P. Gartner, Bristol, Va.	Guar.	8.00	1.00	2.00	12.20
	" " "	" " "	Found	9.00	1.27	2.57	14.48
2388	Tip-Top Bone and Potash Mixture.	J. P. Gartner, Bristol, Va.	Guar.	8.00	....	4.00	11.20
	" " " "	" " "	Found	9.33	.....	4.92	13.32

TABLE No. 1—CONTINUED.

Laboratory No.	Name and Address of Manufacturer, and Name of Brand.	From Whom and Where Collected.	Guaranteed and Found.	Phosphoric Acid Per Cent.	Ammonia, Per Cent.	Potash, Per Cent.	Relative Value Per Ton.
	Royster Guano Co., F. S., Norfolk, Va.						
2389	Royster's Bone and Potash Mixture	W. E. Hildenberger, Crockett's Dept, Va.	Guar.	10.00	....	4.00	13.00
	" " " "	" " "	Found	10.05	....	3.75	12.80
2469	Royster's Arrow Brand Guano	Finneywood, Va	Guar.	8.00	1.00	1.00	11.20
	" " " "	"	Found	9.30	.88	1.27	12.28
	Raisin Monumental Co., The, Baltimore, Md.						
2448	Raisin Seawall Special	J. A. Riddell, Bridgewater, Va.	Guar.	10.00	....	....	8.00
	" " "	" "	Found	14.05	....	....	11.24
2449	Raisin H. G. Acid Phos	A. B. Richards, Winchester, Va	Guar.	14.00	....	1.00	13.60
	" " " "	" "	Found	14.45	....	1.02	14.03
	Southern Chemical Co., Winston, N. C.						
2464	Shin Bone Meal, Real Animal Bone	W. G. Turner & Bro., Henry, Va.	Guar.	20.00	3.50	....	23.10
	" " " "	" " "	Found	26.80	3.50	....	27.86
	Triplett, G. S. P., Jeffersonton, Va.						
2478	Triplett H. G. S. C. Bone	G. S. P. Triplett, Culpeper, Va	Guar.	14.00	....	....	11.20
	" " "	" "	Found	15.93	....	....	12.74
	Va. Carolina Chemical Co., Richmond, Va.						
2376	Allison & Addison Fulton Acid Phosphate	S. K. Morris, Old Field, Va	Guar.	14.00	....	....	11.20
	" " " " " "	" "	Found	14.10	....	....	11.28
2377	Orchilla Guano	J. D. Powell, Mangohick, Va.	Guar.	15.00	....	....	....
	"	" "	Found	15.85	....	....	....
2390	Tinsley's Powhatan H. G. Phos	Capt. Ashby, Brandy, Va	Guar.	14.00	....	....	11.20
	" " "	" "	Found	15.58	....	....	12.46
2391	Gen. German Kainit	Capt. Ashby, Brandy, Va	Guar.	....	....	12.00	11.40
	" " "	" "	Found	....	....	12.32	11.70
2392	Tankage	Capt. Ashby, Brandy, Va	Guar.	....	8.00	....	20.80
	"	" "	Found	....	10.20	....	26.52

2397	Tinsley's Ground Fish	Capt. Ashby, Brandy, Va.	Guar.	....	11.00	....	28.60
	" " "	" " "	Found	....	11.15	....	28.99
2405	Tinsley's Eureka Ammoniated Bone	W. D. Barnett, Malvern Hill, Va	Guar.	8.00	2.00	2.00	15.20
	" " "	" " "	Found	9.68	1.92	2.10	16.57
2406	Valley of Virginia Bone Phosphate	Fenton Noland, Hewlett's, Va.	Guar.	14.00	....	....	11.20
	" " "	" " "	Found	14.43	....	....	11.54
2455	Farmers' Sup. Co's H.G. Bone & Pot'h for wheat & grass	Farmers' Supply Co., Roanoke, Va	Guar.	10.00	....	2.00	11.00
	" " " "	" " "	Found	14.23	....	1.56	14.37
2456	Ideal Bone and Potash	Farmers' Supply Co., Roanoke, Va	Guar.	8.00	....	3.00	10.20
	" "	" " "	Found	8.93	....	2.63	10 67
2457	Royster's H. G. Acid Phos. Old Dom'n Br. Va. C. C. Co.	J. K. Robertson & Co., Christiansburg, Va	Guar.	12.00	....	....	9.60
	" " " " "	" " "	Found	12.54	....	....	10.03
2477	Standard Bone and Potash	Roger Gregory, Tunstall, Va.	Guar.	10.00	....	2.00	11.00
	" "	" " "	Found	10.68	....	1.50	11.11
	Va. State Fertilizing Co. Lynchburg, Va.						
2462	Gen. Germaan Kainit	S. R. Hill, Preston, Va	Guar.	....	....	12.00	11.40
	" "	" " "	Found	....	....	11.44	10.86
2463	Lurich Acid Phosphate	Bradner & Bro. Penhook, Va	Guar.	10.00	....	....	8.00
	" "	" " "	Found	11.68	....	....	9 34
2467	X X Potash Mixture	Cowherd, Loyd, Columbia, Va.	Guar.	10.00	....	4.00	13.00
	" "	" " "	Found	12.35	....	2.97	14.09
2468	Davidson Bros. Gilt Edge Brand Acid Phosphate	Davidson Bros,, Lexington, Va	Guar.	14.00	....	....	11.20
	" " " "	" " "	Found	16.15	....	....	12.92
	Wooldridge Co., The Robert A., Baltimore, Md.						
2476	Wooldridge Liberty Potash Mixture	W. B. Tilghman, Lanesville, Va	Guar.	12.00	....	3.00	13.80
	" " "	" " "	Found	12.95	....	2.42	14.08

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